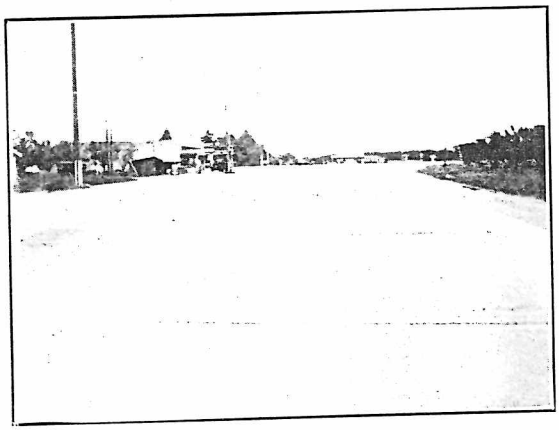
May 1930

The Modern El Camino Real

By Colonel Jno. H. Skeggs, District Engineer

COULD the old mission padres of early California history see today the modern El Camino Real replacing the original winding, dusty trail which they trod on foot or rode on the back of the slow-moving donkey, it is difficult to state which would seem the more miraculous to them—the myriads of swift self-propelled vehicles slipping by, or the smooth wide roadway stretching ahead mile after mile in long, straight courses, varied with graceful curves. It was lovely in



View looking east toward Sunnyvale-Saratoga road intersection where important line change begins.

the simple beauty of those historic days, but they would find it hardly less beautiful now, and far more magnificent.

The transition from the crooked trail of Mission times to the present stately highway has been slow but steady and in keeping with the demands of the day. After the trail came the crooked wagon road, later straightened into the more or less rectangular county road with a definite, though narrow right of way. With the advent of the automobile came the need for a smooth surface, and the metal surfaced county highway anticipated these first demands, after which short stretches of pavement in the vicinity of the larger cities and towns were required.

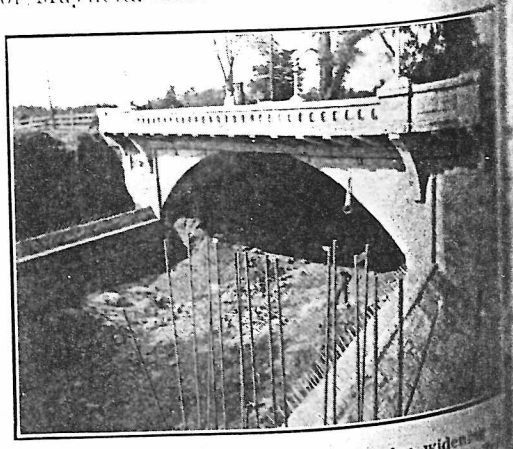
Throughout the entire progressive movement the "Kings Highway" has retained its identity as being not only the most historic but the most important artery of the state. Latest traffic counts show that this is yet consistently the most heavily traveled state road in California.

Of first rank in importance on this highway is that section from San Francisco to San Jose. Locally, this section of the El Camino Real has assumed the name of the Peninsula Highway. For years it was the only through artery serving the Peninsula and San Francisco, and of passing interest Contract No. 1 under the California Highway Commission in 1912 and 1913 was let for construction that portion of this road from South San Francisco to Burlingame in this section.

The parallel building on the Peninsula of the Skyline Boulevard, Route 55, which was started in 1923, and the Bayshore Highway, Route 68, commenced in 1924, somewhat contrary to expectations has failed to halt the steadily increasing traffic on Route 2, the Peninsula Highway. This is due to the rapidly growing urban settlements along the Peninsula, many towns showing an increase in population of over 100 per cent in the last ten years.

From reconstruction funds allotted in the budgets of the past and present biennium construction of the 14-mile section from Palo Alto to Santa Clara is now in progress. This extends approximately from the Santa Clara County line at San Francisquito Creek in Palo Alto to Scott Lane in Santa Clara, and passes through in sucession the towns of Palo Alto and Mayfield (now combined as Palo Alto), Mountain View and Sunnyvale.

This section calls for three important line changes: one about one mile beyond the limits of Mayfield, some 3000 feet in length; one



View showing the new abutments for widening San Francisquito Creek 60-foot span arch bridge present 30-foot to completed 76-foot roadway

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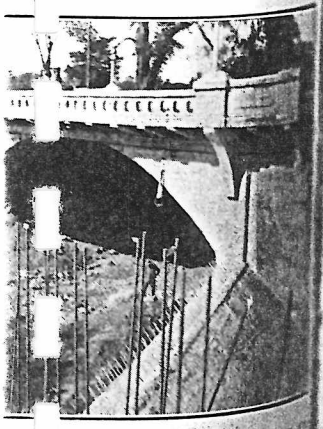

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Anzini's Corner, about 2000 feet in length; and one from Sunnyvale to Butcher's Corner, about 1.8 miles long and saving 0.6 mile distance over the previous location. This 14-mile section is now located with a maximum grade of 1 per cent and a minimum radius curve of 2000 feet.

In brief, the proposed construction calls for utilization of the present 20- to 24-foot width pavement in resurfacing with Type "A" asphalt concrete and widening with asphalt concrete, and concrete over compacted rock base to a 40-foot paved width through Palo Alto; the balance being paved to a 40-foot width of 8-inch to 10-inch thickness of concrete. The roadbed width for the above pavement is approximately 60 feet throughout on a 100-foot right of way. From Mayfield on to Santa Clara the present 20-foot width pavement is to be resurfaced with asphaltic concrete and widened to a completed 30-foot pavement width with 8-inch to 10-inch thickness concrete. The graded roadbed width is to be 50-feet in general, on a 100-foot right of way.

Due to the interurban nature of this highway, right of way problems present difficulties as serious and almost as costly and difficult as those of construction. About 320 ownerships are involved in right of way negotiations in this piece of highway.

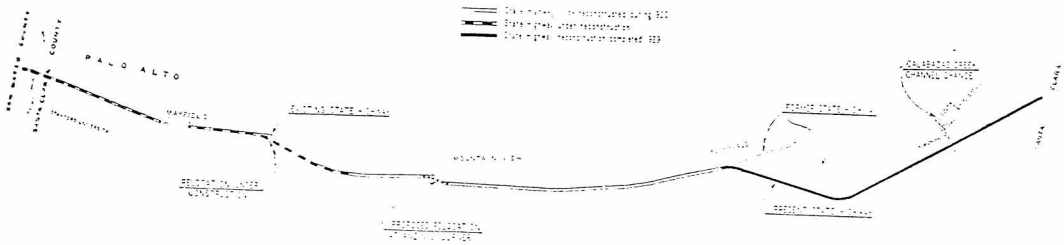
For convenience in construction, this 14-mile stretch from Palo Alto to Santa Clara has been divided into three sections—4.4 miles of which, from Sunnyvale to Santa Clara, having been completed in December, 1929. Another section 4.7 miles in length from Palo Alto to San Antonio Road is now under construction, and the center link of 4.9 miles will shortly be advertised.

The 4.4-mile portion of the Peninsula Highway between Sunnyvale at Saratoga Road intersection and Scott Lane in the City of Santa Clara was constructed under Contract 04EC5. Bids for this work were received on May 22. Work was commenced June 8 and completed December 26, 1929.

Previous to the above contract, this road had been constructed to a 20-foot paved section on a 30-foot width roadbed in the original 66-foot county right of way. All but the last half mile of this was constructed under contract in 1914 of 4-inch Portland cement concrete, with 1½-inch topeka top and 3-foot rock shoulders on either side. The same type of construction was placed on the last half mile by state forces in 1918 and 1920.

The present contract called for placing of 4-inch to 5½-inch thickness of asphalt concrete over the original 20-foot pavement, widening 10 feet on one side only, with 8-inch to 10-inch thickness Class "A" concrete.

A line change of special importance was made from Sunnyvale to Butcher's Corner. This resulted in a saving of 0.6 mile distance and eliminated two right angle turns with 260- and 300-foot radii. This new location, 1.8 miles in length with 100-foot right of way, was paved with 3 ten-foot strips of 8-inch to 10-inch concrete over a 4-inch compacted rock base.



Map showing the modern El Camino Real from Palo Alto to Santa Clara.

Right of way problems on this project were somewhat complicated, the line change alone involving some 22 ownerships and costing, exclusive of moving buildings and improvements, in excess of $86,000. The total number of ownerships involved was 62.

At Sunnyvale-Saratoga Road intersection, it was necessary to move one commercial garage building 75 feet by 100 feet, two service stations and all fixtures, a cafe, and one residence. Three thousand trees had to be removed. It was necessary to go to condemnation with but one property owner on the entire 4.4 miles of right of way negotiation.

This section is in the heart of a rich territory wholly occupied by orchards and intensively cultivated fields merging into urban settlements. Many interesting features were presented in construction of special siphons for irrigation systems which the new location literally cut in two.

A particularly interesting combined right of way and construction problem presented itself in changing the channel of Calabasas Creek. The original channel of this creek extended easterly and was within the right

(Continued on page 32.)

THE MODERN EL CAMINO REAL

(Continued from page 7.)

of way approximately 35 feet north of and parallel to the center line for a distance of 0.6 mile before joining Campbell Creek, which flows to the north. This channel was discontinued and filled up, giving a full 12-foot shoulder width with flat slopes to or near the right of way line. Through agreement with the property owners a new channel was extended almost due north from the highway about ¼ mile, at which point it empties into a deep borrow pit from which material was taken to fill the original channel along the highway. Approximately 700 feet beyond this borrow pit a levee extending in a northeasterly direction was thrown up for a distance of 1650 feet, at which point it was directed southeast for 740 feet, this point being approximately 2000 feet north of the highway about half way between Calabasas and Campbell creeks. From this point, in a northeasterly direction, a new channel was cut across to a junction with Campbell Creek approximately 3000 feet north of the highway. During the summer months Calabasas Creek is dry, but in the rainy season water flows down the new channel to the borrow pit, it now acting as a reservoir which tends to replenish the supply of ground water to adjacent property. During heavier rains this reservoir overflows and is contained within the levees around the low-lying contiguous land. This results in a deposit and gradual upbuilding of light silt—a feature desired by the property owner. In time of excessive flood the water finds outlet through the new channel beyond. Most of the water settles and is conserved. The silt deposit each spring is plowed into the heavy soil with entirely beneficial results. The past season saw a deposit of several inches. Thus the state was relieved of further responsibility in maintaining 0.6 mile of Calabasas Creek, and was enabled to obtain a highway of standard section with adequate provisions for future widening. This work was done under Day Labor Work Order under informal bid contract by N. M. Ball of Porterville, who was also the general contractor on this section between Sunnyvale and Santa Clara. C. F. Price was the resident engineer. Construction cost of this section was approximately $227,000.

The second section of this 14 miles now under construction extends from 1000 feet north of the county line at San Francisquito Creek in San Mateo County to San Antonio Road in Santa Clara County. This has a net length of 4.36 miles though it has a gross length of 4.74 miles, there being an exception of 0.38 mile through the town of Mayfield.

This project extends through the combined City of Palo Alto and Mayfield. The details, both as to right of way and construction, are rather involved due to present structures, city pavement, curbs and sidewalks, and intersecting streets. Several improvements in alignment are being effected by acquisition of right of way largely on one side in acquiring the new 100-foot width without discarding any of the original right of way. One such change extends from the beginning of the project for a distance of 0.7 of a mile, removing reverse curves and unsightliness from alignment, and provides for widening the 60-foot span arch bridge over San Francisquito Creek bridge on one side only to a 76-foot roadway width including one 6-foot sidewalk.

Two other slight changes are effected at curves in the vicinity of Yeguas Creek to make it necessary to widen the structure on one side only, and the approach to the important county road intersection at San Antonio avenue near the end of this project.

A more important revision in location is made about 3½ miles from the beginning of this job, where a 300-foot radius curve is eliminated. From a right of way standpoint, this change involves a heavy expenditure, including moving of buildings, in settlement with one party only, "Mammy's Shack," of more or less local fame.

The original pavement was constructed to a 20-foot width of 5-inch waterbound macadam with 1½-inch topeka top and 3-foot oil macadam shoulders, though through the town of Mayfield, 6-inch concrete, 24 feet in width, was placed, under contract in 1914, excepting the first 1400 feet which was placed this same year by state forces. The present contract calls for 4½ inches of Type "A" asphalt concrete surface laid in two courses over the present pavement, widening over 6-inch compacted rock base to 40-foot width, with 8-foot shoulders from the beginning of the project to Mayfield. Through Mayfield, excepting the 0.38-mile business district, 40 feet of 8-inch to 10-inch concrete in four 10-foot strips is being placed over a 4-inch compacted rock base. The balance of the project includes about one mile of 8-inch to 10-inch thickness of concrete, 30 feet wide, and one mile of 4½-inch asphalt concrete Type "A" in two courses on present 20-foot pavement and 10-foot width of 8-inch to 10-inch thickness

Class "A" concrete over 4-inch compacted rock base on the left side.

Right of way involved 103 ownerships out of which 6 suits were necessary, one of which is a friendly suit against Stanford University, this being the only legal way title could be obtained. The widening of right of way through the town of Palo Alto was facilitated by the abandonment and removal of the tracks of the Peninsula Railway Company for approximately two miles. The removal of these tracks from the highway right of way is the result of negotiations carried on with the railway company over a period of six years or more, and is considered an achievement of note, for it is felt that there is no justification for the location of an electric railway inside a state highway right of way.

It is necessary to carry all traffic through this job since the only detours available are Palo Alto streets, which would require through traffic to cross twice at grade the main line of the Southern Pacific Railway, where over 70 fast trains pass daily. The completion date for this contract between Palo Alto and San Antonio Road is September 12, 1930. Contract allotment is approximately $311,000, which includes the construction of the San Francisquito Bridge for which a special allotment of $20,000 had been budgeted. Hanrahan Company of San Francisco is the contractor, and C. F. Price the resident engineer.

The final and center link of this 14-mile section from Palo Alto to Santa Clara is 4.89 miles in length without exceptions and extends from San Antonio Avenue to Sunnyvale.

This project involves but one line change—that at Anzini's Corner—where it is proposed to replace the existing 400-foot radius curves reversing on 135 feet of tangent, with two 2000-foot radius curves, reversing on 350-foot tangent. It is planned to make park areas of the two triangular pieces of property between the old and the new locations at this change. The present pavement was constructed 20 feet in width in 1913 and 1914, and consists of a 1½-inch topeka top over a 5-inch waterbound macadam base for the first 2¾ miles of this section, the balance being a 1½-inch topeka top over a 4-inch concrete slab.

The present plans are for a graded roadbed 30 feet in width, a pavement 30 feet in width throughout in a full 100-foot right of way. A 4½-inch asphalt concrete Type "A" surface laid in two courses will be placed on the existing 20-foot pavement throughout, except ing through the line change at Anzini's Corner, where a 30-foot width of 8-inch to 10-inch thickness concrete is to be placed over a 4-inch compacted rock base. Widening is to be effected from the beginning of this project to the line change at Anzini's Corner on the left side, approximately one mile in length, by placing a 10-foot strip of concrete Class "A" 8 inches to 10 inches thickness over a 4-inch compacted rock base. Beyond the line change for the balance of the project, this widening of similar construction will be on the right side of the existing pavement.

This strip of highway passes through the town of Mountain View, where city lots of 25-foot frontage are involved. Due to this fact, 155 parcels and owners must be dealt with. Right of way negotiations also involve the moving of about 40 buildings, some half dozen service station pump installations and many irrigation conduits, in addition to about 20 ornamental gate posts and columns and the usual fence.

The construction contract will call for removing and replacing about 8000 feet of concrete or iron irrigation pipe from 8 inches to 12 inches in diameter, widening Stevens Creek 20-foot span arch bridge on both sides to a completed 76-foot roadway width, and replacing the Permanente Creek 12-foot span arch, which was built by the county in 1899, with a concrete box to be constructed inside the present arch to give full 76-foot roadway width.

A good detour is available for the entire job during construction; but, due to the heavy urban local settlement, this is not considered practicable; so it is planned to carry full traffic through the job during construction.

Right of way negotiations for this section are progressing nicely, and it is expected that it will be advertised shortly.

It is expected that the public will be enjoying the fully reconstructed and otherwise modern improved El Camino Real, between Palo Alto and Santa Clara, not later than the spring of 1931.

AIN'T IT THE TRUTH

"When you find a public official who pleases everybody, there will be a glass plate over his face and he will not be standing up."

A backwoodsman one day found a mirror which a tourist had lost. "Well, if it ain't my old dad," he said as he looked in the mirror. "I never knew he had his pitcher took."

He took the mirror home, stole into the attic to hide it, but his actions did not escape his suspicious wife. That night, while he slept, she slipped up to the attic, and found the mirror. "Hm-m," she said, looking into it. "So that's the old hag he's been chasin.'"—*The Drano Bulletin.*

ment. The Dean Construction Co. of Berkeley is contractor.

Bids are being received for a new bridge across the Salinas River at Bradley. This will be under the supervision of the Bridge Department.

NEVADA COUNTY

Grading between Nevada City and one mile west of Washington road on the Ukiah-Tahoe Highway has been completed, oil treated stone surfacing is 80 per cent complete, and the entire project will be finished, it is estimated, by next July. C. R. Adams has the contract for both the grading and the surfacing.

ORANGE-LOS ANGELES COUNTIES

A contract for oiling shoulders between Galivan and Irvine and from Fullerton to Leffingwell Ranch in Los Angeles County has been awarded to G. M. Duntley. It is expected that this contract will be completed by July 1st.

ORANGE COUNTY

A contract for widening the roadbed between Sunset Beach and Newport the entire width of the 90 to 100-foot right of way, and the placing of an additional 10-foot strip of Portland cement concrete has been awarded to the Macco Construction Company. When this work is completed the pavement will be 20 feet wide for the entire distance. It is expected that this work will be completed by next September.

PLACER AND NEVADA COUNTIES

Resumption of 20 miles of grading after the winter shutdown on the highway between Airport and Soda Springs, a part of the Dutch Flat-Donner Lake wagon road, has been made by both T. E. Connolly, who has the contract for the first 9½ miles, and by Callahan Construction Co., who have the contract for the last 10½ miles. Seven miles of the Callahan job, between Big Bend Rangers Station and the end of the work has been completed and is ready for the surfacing which has been programmed for the entire length of the new grade. All of the grading is scheduled for completion by this coming fall and the surfacing is estimated to be completed by the summer of 1931.

SAN BENITO COUNTY

A survey is in progress for the relocation of the state highway between Salinas and San Juan Bautista by way of Prunedale. This will completely eliminate from the Coast Highway the present San Juan grade, which is one of the worst sections on this highway. This change is partly in Monterey County and partly in San Benito County.

SAN DIEGO COUNTY

A contract for grading the Rose Canyon road between Balboa avenue and Torrey Pines road has just been completed by the R. E. Hazard Contracting Company. This section is 5.4 miles long and is a 46-foot graded roadbed.

A contract for 4.5 miles of 38-foot graded roadbed between La Posta Creek and Miller Creek on the San Diego-El Centro highway has just been completed by the Nevada Contracting Company.

A contract for grading 2.9 miles of 36-foot roadbed from Kitchen Creek to La Posta and paving with 20 feet by 7 inches Portland cement concrete was awarded June 25, 1929, to Basich Brothers. This section is on the San Diego-El Centro highway. Work on this section is rapidly nearing completion. It is expected that this contract will be finished by July 1, 1930.

A contract for grading a 30-foot roadbed between Miller Creek and Tecate Divide on the San Diego-El Centro highway was awarded to Monarch & Breen on August 17, 1929. This work is rapidly nearing completion and should be finished by July 1, 1930.

A contract for oiling the shoulders on various stretches aggregating approximately 35 miles between San Diego and Myers Creek Bridge on the San Diego-El Centro highway was recently awarded to the Gilmore Oil Company. It is expected that this contract will be finished by July 1.

Another contract for oiling the highway shoulders between Oceanside and the Orange County line has been completed by G. M. Duntley, contractor.

A contract for widening the roadbed and paving with Portland cement concrete 30 feet wide across San Mateo Flat, between San Onofre and San Clemente, has been awarded to Matich Bros., contractors. The new pavement will be 0.57 of a mile long.

SAN LUIS OBISPO COUNTY

Work is nearing completion on the construction of a 20-foot asphaltic concrete pavement between Atascadero and Paso Robles. Steele Finley is the contractor.

Street improvements, including a half mile of state highway, in the town of Atascadero is complete. The work was handled by a local improvement district. M. J. Bevanda was the contractor.

On the Coast Highway between Santa Maria River and Los Berros Creek, a distance of 7.2 miles, the road is being reconstructed with a 36-foot roadbed and a 20-foot Portland cement concrete pavement. Grading work is complete and rapid progress is being made on the pavement. J. F. Knapp is the contractor.

Plans have been completed for the proposed reconstruction of the Coast Highway between San Luis Obispo and Cuesta Grade, a distance of about three miles, and this work will soon be advertised.

SAN MATEO COUNTY

Construction of the first link of the Bayshore Highway, which has been located as an express road to facilitate fast moving traffic between the cities of San Francisco and San Jose, is nearing completion under contract with the H. W. Rohl Company. This project would have been completed some time ago but for the occurrence of heavy slides near Visitacion. The slide material has been utilized in improving the grades and in further widening of the roadway. Between Visitacion and Sierra cut a 4 per cent grade has thus been eliminated, being replaced by a 1 per cent grade. This project, which extends from the San Mateo County line at the city limits of San

Francisco to the north city limits of the city of South San Francisco, a distance of 3½ miles, involves over 1,000,000 yards of grading.

Another major link of the Bayshore Highway extending 7.3 miles between the towns of San Mateo and Redwood City, under contract with Frederick & Watson Construction Company and Frederickson Bros., is now about 35 per cent completed. This project extends across the marshes and salt ponds along the westerly side of San Francisco Bay and involves some 630,000 cubic yards of grading quantities, about 40 per cent of which is composed of hydraulic fill between previously constructed levees. The balance of this material is being taken from Belmont Hill, some 250,000 yards having been placed at the present time between Belmont and San Mateo.

With a paving contract of 40 feet width concrete between the cities of South San Francisco and Burlingame and another grading contract between Redwood City and Palo Alto shortly to be advertised for bids, this highway will assume its portion of the traffic from the overburdened Peninsula Highway. This should develop much industrial property along the shores of San Francisco Bay.

Under state maintenance forces 11 miles of Route 55, Skyline Boulevard, between Tanforan road and La Honda road, work has just been completed on the placing of an armor coat. Heavy traffic is expected on this road during the summer months, particularly on holidays. An additional 14 miles of the Skyline Boulevard, between La Honda Road and Saratoga Summit, is being given a light oil seal coat at the present time by state maintenance forces.

Due to the fact that Route 55 follows the ridge along the county line, this section lies within three different counties, San Mateo, Santa Clara and Santa Cruz, swinging back and forth across the boundary line in numerous places. This work should be completed by the middle of June.

SANTA BARBARA COUNTY

On the Coast Highway between Wigmore and Zaca, a distance of 4 miles, the road is being reconstructed with a 36-foot roadbed and a 20-foot Portland cement concrete pavement. Placing of pavement is progressing. The Cornwall Construction Company is the contractor.

On the Cuyama lateral the road is being oiled from Buckhorn Canyon to the second crossing of the Cuyama River. The Gilmore Oil Company is the contractor.

On the Coast Highway from the Elwood overhead to Goleta, and from Carpinteria to the Rincon cut-off, the shoulders are being oiled. The Bradley Truck Company is the contractor.

Bids will be opened on June 11 for the grading and surfacing with oiled crushed gravel or stone of the Cuyama lateral from the third crossing of the Cuyama River to the Kern County line, a distance of about 26.2 miles. A portion of this project is located in San Luis Obispo County.

SANTA CLARA COUNTY

Contract of the Hanrahan Company for grading and paving from San Francisquito Creek through the towns of Palo Alto and Mayfield to San Antonio road, a distance of 4.4 miles, has passed the preparatory stages and paving operations are to be commenced immediately. This project calls for graded roadway 56 feet in width with 40 feet width of pavement Portland cement concrete and asphalt concrete for the 2.2 miles, being that part through the towns, the balance being a graded roadway width of 50 feet with feet width of pavement.

Right of way is being widened to 100 feet throughout and, due to the urban nature of the territory through which this project passes, it calls for the solving of many complicated problems.

Paving operations are being started at the south end of the project.

The present construction is an important link in Route 1, "El Camino Real," between San Francisco and San Jose.

The 4.9 miles section of this highway adjoining the present project on the south has been advertised, bids being called for on June 11, 1930.

SANTA CRUZ COUNTY

Contractor Jack Casson, working with state maintenance forces, has just completed the application of a light fuel oil seal coat on Route 42 on Saratoga Summit to and through California Redwood Park, a distance of 23 miles.

VENTURA COUNTY

A contract has been awarded to California Road Oil Service for oiling shoulders from Camarillo to Ventura and from Ventura to Seacliff. It is expected that this contract will be completed by July 1st.

YUBA COUNTY

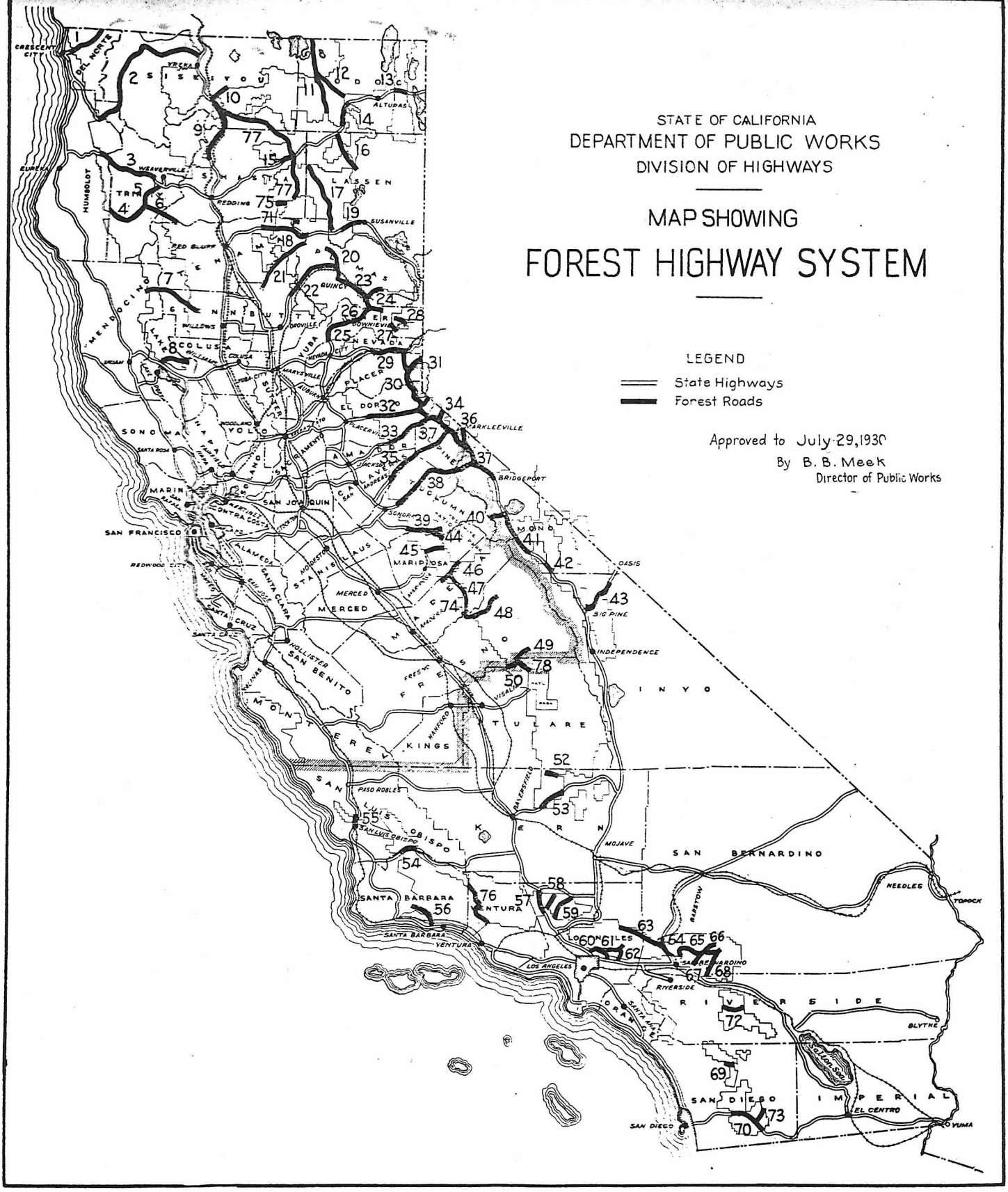
A 20-foot Portland cement concrete pavement on partly new alignment through Wheatland has been contracted for by C. W. Wood. Minor drainage structures and grading recently begun are to precede the pouring of the concrete pavement. Rock borders, 3 feet wide on each side of the pavement, will be constructed after the concrete is all poured. It is contemplated that the entire project will be completed by next August.

LIST OF HIGHWAY BIDS
For Month of May

ALPINE COUNTY—Oiling 8.6 miles between Hangmans Bridge and Woodfords. Dist. X, Rt. ... Secs. C. D. Basalt Rock Co., Napa, $3,312. Contract awarded to Skeels & Graham Co., Roseville, $3,294.

DEL NORTE COUNTY—Between Smith River and Patricks Creek, 15.2 miles to be surfaced with untreated gravel or stone. Dist. I, Rt. 1, Secs. C. ... Tieslau Bros., Berkeley, $39,217; Hemstreet & ... Marysville, $40,810. Contract awarded to ... Bros., Eureka, $32,650.

COLUSA COUNTY—Between Williams and ... well, 8.3 miles to be graded. Dist. III, Rt. 7, ... B. C. Lord & Bishop, Sacramento, $85,504; M. ... Bevanda, Stockton, $69,500; Isbell Construction ... Fresno, $89,377; T. M. Morgan Paving Co., Los ... geles, $74,944; Kennedy-Bayles Construction ... Biggs, $71,052; A. Teichert & Son, Sacramento, ...



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N Skyline Intermediate
S Skyline unimproved
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OAKLAND
ALAMEDA
SAN LEANDRO
HAYWARD
CONTRA COSTA
MARTINEZ
RICHMOND
BERKELEY
MARIN
SAN RAFAEL
SAN MATEO
REDWOOD CITY
PALO ALTO
SANTA CLARA
SAN JOSE
SANTA CRUZ
SAN BENITO
HOLLISTER
SALINAS
MONTEREY
SANTA BARBARA
NATIONAL FOREST
SOLANO
FAIRFIELD
VALLEJO
NAPA
SONOMA
PETALUMA
SACRAMENTO
STOCKTON
LODI
MODESTO
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STANISLAUS
SAN JOAQUIN
AMADOR
CALAVERAS
JACKSON
SONORA
TUOLUMNE
YOSEMITE
MARIPOSA
MADERA
FRESNO
KINGS
TULARE
HANFORD
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SEQUOIA NATIONAL PARK
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MONO
BRIDGEPORT
Golden Gate
Golden Gate Park
Presidio
Fort Mason
Alcatraz
Yerba Buena
Treasure Island
Oakland Inner Harbor
Oakland Outer Harbor
Alameda
Oakland Airport
San Leandro Bay
Hayward Landing
Dumbarton Bridge
Redwood Creek
Palo Alto Airport
Stanford University
Mayfield
Mountain View
Moffett Field
Sunnyvale
Santa Clara
Alviso
Milpitas
Berryessa
Evergreen
Edenvale
Mt. Hamilton
Campbell
Saratoga
Los Gatos
Saratoga Gap
Alma
Almaden
Patchin
Wrights
Skyland
Laurel
Madrone
Morgan Hill
San Martin
Gilroy Hot Springs
Coyote
Gustine
Volta
Los Banos
Dos Palos
South Dos Palos
Bells Station
Pacheco Pass
Pacheco
Gilroy
Chittenden
Aptos
Capitola
Soquel
Watsonville
Aromas
Lonetree
Cleveland
San Juan Bautista
Tres Pinos
Moss
Castroville
Natividad
Paicines
Bonanza
Oro Loma
Firebaugh
Cromir
Mendota
Dairyland
Ash Slough
Berenda Slough
Fresno River
Berenda
Miller
Sesame
Grabners
Tollhouse
Burrough
Trimmer
Pineridge
Shaver
Big Creek
Northfork
Coarsegold
Raymond
Knowles
Ben Hur
Ahwahnee
Oakhurst
Bass Lake
Grubgulch
Lewis
Sugar Pine
Miami
Wawona
Yosemite
Camp Curry
Casa Diablo
Mono Mills
Mono Lake
Lundy
Tioga Pass
Leevining Creek
Crater L.
Sweetwater
Masonic
Falls Hot Springs
Junction
Sonora Pass
Strawberry
Niagara
Baker
Bodie
Lockeford
Lodi
Woodbridge
Clements
Waterloo
Herald Creek
Wallace
Camanche
Campo Seco
Mokelumne Hill
Fosteria
Jackson
Sutter Creek
Amador
Westpoint
Mokelumne River
Electra
Pine Grove
Volcano
Ione
Plymouth
Shenandoah
Fiddletown
Drytown
Sloughhouse
Elk Grove
Sheldon
Twin Cities
Galt
Acampo
Thornton
Walnut Grove
Isleton
Courtland
Clarksburg
Freeport
Locke
Hood
Sacramento River
Delta
Rio Vista
Suisun
Cordelia
Benicia
Vallejo
Mare Island
Napa
Napa Soda Springs
Yountville
Oakville
Rutherford
St. Helena
Calistoga
Petrified Forest
Chiles
Capell
Atlas
Glen Ellen
Cove Dale
Sugarloaf
Kenwood
Sonoma
Boyes Hot Springs
El Verano
Cotati
Penngrove
Petaluma
Two Rock
Valley Ford
Bloomfield
Freestone
Bodega
Bodega Bay
Tomales
Dillon Beach
Point Reyes
Inverness
Olema
Point Reyes Station
Nicasio
Lagunitas
Fairfax
San Anselmo
Ross
Larkspur
Corte Madera
Mill Valley
Sausalito
Tiburon
Belvedere
Alto
Bolinas
Duxbury Pt.
Stinson Beach
Muir Woods
Mt. Tamalpais
Golden Gate Bridge
Fort Baker
Fort Cronkhite
Fort Barry
Fort Scott
Fort Point
Lime Point
Point Bonita
Point Diablo
Point Richmond
Point Pinole
Point San Pedro
Point Reyes
Point Sur
Point Lobos
Point Pinos
Point Cypress
Point Carmel
Point Lucia
Point Piedras Blancas
Point Arguello
Point Conception
Point Arena
Point Reyes
Gulf of the Farallones
Farallon Islands
Monterey Bay
Pajaro River
Elkhorn Slough
Moss Landing
Monterey
Pacific Grove
Pebble Beach
Cypress Pt.
Carmel
Seaside
Del Monte
Spreckels
Chualar
Gonzales
Soledad
Camphora
Metz
Greenfield
Jamesburg
Paraiso Springs
Tassajara Hot Sprs.
Big Sur
Lonoak
King City
Bitterwater
Idria
Hernandez
Pinnacles National Monument
Cook
San Benito
Panoche
Llanada
Mulberry
Paicines
Tranquillity
Kerman
Kearny Park
Fresno
Malaga
Del Rey
Fowler
Sanger
Kingsriver
Wahtoke
Squawvalley
Miramonte
Badger
Reedley
Parlier
Selma
Dinuba
Sultana
Orosi
Cutler
Yettem
Kingsburg
Monson
Traver
Woodlake
Kawean
Auckland
Lemoncove
Lindcove
Exeter
Lindsay
Strathmore
Porterville
Polar
Plano
Terra Bella
Ducor
Earlimart
Success
Tipton
Pixley
Quail
Angiola
Stoil
Alpaugh
Waukena
Paige
Corcoran
Guernsey
Stratford
Armona
Hanford
Lemoore
Huron
Coalinga
Alcalde
Oilfields
Priest Valley
Rogers
Stone Canon
San Ardo
San Lucas
Lockwood
Jolon
Lucia
Gorda
Hames
Valley
Parkfield
Cholame
Shandon
Creston
Templeton
Paso Robles
Atascadero
Santa Margarita
Pozo
Cuyama
Huron Road
West Haven
Oil King School
Goshen
Kink
Visalia
Garage
Merryman
Enter
Lemoncove
Lindcove
Strathmore
Porterville
Polar
Plano
Terra Bella
Ducor
Earlimart
Success
Tipton
Pixley
Quail
Angiola
Stoil
Alpaugh
Waukena
Paige
Corcoran
Guernsey
Stratford
Armona
Hanford
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Huron
Coalinga
Alcalde
Oilfields
Priest Valley
Rogers
Stone Canon
San Ardo
San Lucas
Lockwood
Jolon
Lucia
Gorda
Hames
Valley
Parkfield
Cholame
Shandon
Creston
Templeton
Paso Robles
Atascadero
Santa Margarita
Pozo
Cuyama

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...ncrete overhead structure ...
...ic ... railroad tracks at ...
...Sie... & Kendall and F. ...

...tr... span overhead cross...
... tracks at California Park ...
...uct with Frederickson and ...
...ny and Frederickson Bros. ...
...tio... of a little painting ...

...ge ... ler contract with the ...
...ny at Corte Madera Creek, ...
...pleted with the exception of ...
... is in process of erection. ...
... wi... the surfacing contract ...
...nd ... Carlin should be com...
...ne ... August, allowing traf...
... co... pleted highway between ...
...th a shortened distance ...
... and one-half miles.
...n of the Redwood Highway ...
...nde... contract to Granfield, ...
...ned... to traffic on July 26th. ...
... F... oes Station on this ...
...occa & Coletti, having been ...
... to the finishing of the ...
...alled for grading a 40-foot ...
...rem... t for 1.3 miles and ...
... pa... ement for 0.5 mile. ...
...cte... sections of roadbed ...
...the... newly graded portions ...
... (See special article attached ...
...n July 23d for constructing ...
...tween Alto and Tiburon. ...
...n ... to 56 feet in width ...
... su... ace 20 feet wide.

... SONOMA COUNTIES

...e ... nrahan Company for ...
...le section of Route 1, Redw...
...acio in Marin County and P...
...nty ... is nearing completion. ...
...ing... of this work is the two...
...The ... contractor has consider...
...y a... ead of his schedule in ...
... so it is expected that this ...
...y that time. All the gra...
...s of concrete pavement 20 ...
...der ... his contract has been ...
...ous... macadam on the balance ...

...OCINO COUNTY

...Company, working with ...
...mpleted the application of ...
... of State Highway, Route ...
...ear... in June. This highway ...
...on ... holidays and Sundays ...
... N... arro River, the Redwood ...
...vhic... offers delightful camping ...
...nd swimming and other outdoor ...

...armor ... coat to the 8 miles ...
...vee... Ukiah and Forsythe Creek ...
... M... intenance Forces about ...

...haltic ... road oil under contract ...
... of Sacramento for 12 miles ...
...ween Cloverdale and Hopland ...
...bei... handled by State Main...
...ing ... completion. This should ...
...1 Ju...

...O COUNTY

...xten...ng from Mattly Ranch ...
...f approximately two miles ...
... C. Miles, Contractor, ...
...out the middle of August.
...es ... State Highway construc...
...ed ... r early letting between ...
...four ... miles south of Colevi...
...e Highway follows the Wa...
...pleted, will add materially ...
...e country east of the ...

Several contracts have recently been completed for ... filling and road-mixing of about 40 miles of high... ... upon which there has been no permanent con... ... The first of these pieces extends from the ... of Sherwin Hill to Devil's Punch Bowl, 24 ... the second extending from Devil's Punch Bowl ... Lakeview, which also includes a short stretch ... the town of Bridgeport.

MONTEREY COUNTY

The bridge across the Salinas River on the Coast ...way at San Ardo is nearing completion. Ben C. ... is the contractor under the supervision of the ... Department. The approaches to the bridge ... been completed by Frederickson and Watson and ... Brothers, Contractors.

A contract has been awarded to H. E. Doering for ... construction of a new bridge across the Salinas ... on the Coast Highway at Bradley. This work ... under the supervision of the Bridge Department.

On the San Simeon-Carmel Highway a timber bridge ... being constructed across Alder Creek. The Dean ... Company, Contractor, has established a ... near the site. The Bridge Department has super... ... of this work.

Two convict camps are maintained on the San ... Carmel Highway. Camp 15 at Salmon Creek ... a crew of 90 men and Camp 18 at Little Sur ... a crew of 70 men. Camp 15 is to be moved to ... Creek during August and will thereafter be ... as Camp 22. Surveys and plans are in progress ... the two camps.

Surveys are in progress for relocating San Simeon-Carmel Highway from Rocky Creek to Carmel through ... Highlands.

NEVADA COUNTY

Grading and oil-treated stone surfacing between ... City and one mile west of Washington Road on ... Ukiah-Tahoe Highway will be completed within ... month. C. R. Adams has the contract for the ... work.

PLACER AND NEVADA COUNTIES

Grading of the highway between Airport and Soda ... a part of the Dutch Flat-Donner Lake wagon ... by T. E. Connolly, who has the contract for the ... miles, and by Callahan Construction Co., Inc., ... has the contract for the last 10½ miles, is being ... as rapidly as possible to permit the placing ... stone surfacing which has been contracted ... on the entire length of the new grade.

SAN BENITO COUNTY

Surveys are in progress for the elimination of San ... Grade between Salinas and San Juan Bautista. ... study is being made to locate the line in ... that will preserve the natural beauty of ... Rocks along the route. About 10 miles of ... has been located. This project is located in ... and Monterey counties.

SAN LUIS OBISPO COUNTY

Very satisfactory progress is being made on the ... of the Coast Highway between the ... Maria River and Los Berros Creek. This is a ... Portland cement concrete pavement on a 36-... roadbed. Placing the pavement is complete. J. F. ... is contractor.

Plans are complete for the construction of a 20-foot ... pavement across the bed of the Santa Maria ... This is a dry weather detour around the ... steel truss bridge, one span of which col... on June 10th, 1930. The wrecked span will be ... by a temporary trestle to carry traffic during ... water.

Bids were received on July 23d on the reconstruction of the Coast Highway between San Luis Obispo and Cuesta Grade, a distance of about three miles.

On the Cholame Lateral a seal coat is being applied to the bituminous macadam surface between Estrella River and the Sacramento Ranch, a distance of about six miles. The Granite Rock Company is the contractor.

SAN MATEO COUNTY

The contract with the H. W. Rohl Company for grading and surfacing that section of the Bayshore Highway between the southerly city limits of San Francisco and the northerly city limits of the city of South San Francisco has been practically completed. The operations of this Contractor, however, have been extended by special arrangement to some grading and temporary surfacing within the city of South San Francisco on the adjoining section of this major highway. A heavy fill is being made in the vicinity of Linden avenue in order to give this fill the benefits of the compaction due to the winter rains and the carrying of the heavy traffic using this road. This work should be completed early in August.

The next important link of the Bayshore Highway between South San Francisco and Broadway, Burlingame, 5.2 miles, was recently awarded to the Basich Bros. Construction Company of Los Angeles. Work is to be commenced on this section of a 40-foot width concrete pavement early in August and should be completed before the first of the year.

The 7.3-mile section of the Bayshore Highway under grading contract to Frederickson & Watson Construction Company and Frederickson Bros., from San Mateo to Redwood Slough, Redwood City, is about 60 per cent complete, the Contractor on this work being about one month ahead of schedule. Progress on the hydraulic fill portion of this roadway has been a slightly retarding factor, but as this work is practically completed and unless unforeseen circumstances arise, this work should also be completed by the first of the year.

The adjoining section of Bayshore Highway to the south for grading from Redwood Slough to Willow Road, a distance of 4.1 miles, will be advertised for bids at an early date.

SANTA CLARA COUNTY

Work on the contract of the Hanrahan Company for grading and paving between Palo Alto and San Antonio Road, a distance of 4.4 miles is about half completed. Approximately two miles of paving full 30-foot width has been placed from Matadero Creek to San Antonio Road. This job has been consistently behind schedule but should be completed before the first of the year.

The center link of the major section of the Peninsula Highway from Palo Alto to Santa Clara, being 4.9 miles in length, between San Antonio Road and Sunnyvale has also been awarded to the Hanrahan Company. Work was started on this section late in June. This project calls for resurfacing the existing 20-foot pavement with asphalt concrete and widening with a 10-foot strip of concrete to a 30-foot paved width throughout on 50-foot graded roadbed within a 100-foot right-of-way. With the completion of this unit in early 1931 the public will enjoy the use of the widened, resurfaced 14-mile section between Palo Alto and Santa Clara on an alignment vastly superior to that which previously existed.

A 10.7-mile section of Route 32, the Pacheco Pass Highway, between San Felipe and Bell Station for grading and surfacing with bituminous macadam on a vastly improved alignment will be advertised in the early fall of this year. This project is an important link in the major plan for a fast highway between the San Joaquin Valley and the bay districts of California.

SANTA CRUZ COUNTY

A contract for grading and surfacing 2.7 miles of State Highway, Route 42, between Saratoga Gap and Waterman Switchback was awarded to O. A. Lindberg of Stockton in July, work being started about the middle of this same month. This project, which calls for 243,000 cubic yards of roadway excavation will greatly improve the alignment and shorten the dis-

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wood Highway. The completed contracts included five projects on various portions of this scenic coastal route extending from Ignacio in Marin County to Wilson Creek in Del Norte County.

The largest of these projects consisted of the reconstruction of the highway from Ignacio, about seven miles north of San Rafael, to Petaluma in Sonoma County. This work, costing $581,700, consisted of constructing a 36-foot graded roadbed and placing Portland cement concrete pavement 20 feet wide, except over fills where settlement is expected, the surfacing consisted of twenty feet of bituminous macadam. Several necessary betterments in line and grade were made, eliminating 6 per cent grade and short radius curves, saving some 4000 feet of length, and unsatisfactory drainage conditions were remedied.

In Humboldt County the mile and a half from the southerly boundary to Richardson's Grove was graded and surfaced with untreated crushed rock on an improved alignment and grade. The contract amounted to $59,500.

Portland cement concrete pavement was placed on about five miles of the highway in Humboldt County covering three short sections, one at Scotia and a second from Fortuna to Loleta and the third over the half mile immediately south of Eureka. The roadbed on these three sections had been previously constructed to modern standards. This work, covered by two contracts, amounted to $190,000, and increases the concrete pavement on the Redwood Highway in Humboldt County to approximately 35 miles.

The thirteen miles from the southerly boundary of Del Norte County to Wilson Creek was surfaced with untreated crushed rock 20 feet wide. The alignment and subgrade on this portion of the road have been brought to modern standards within recent years, and the present surfacing gives a smooth riding surface along the steep mountain slopes and through the thick forests which this section of the Redwood Highway traverses. The cost was $95,500.

A small but much needed improvement on this route will be the replacing of the timber lift span on the bridge across Eureka Slough at Eureka, for which bids were opened during the past period. To cost less than $5,000, this project is of a temporary character, as the complete reconstruction of this structure will be made within a few years. The present bridge was constructed by the state in 1919.

The completion of construction on the new alignment of the Redwood Highway between San Rafael and Sausalito is forecast by the advertising and opening of bids on that sector between Alto and Waldo. Bids were opened on November 19th for the construction of three miles of roadway between these two points. The graded roadbed is to be 46 and 56 feet wide, and the surfacing will be a bituminous macadam pavement 30 and 40 feet wide. This project will connect at its northerly end with that portion of this new alignment from Alto to San Rafael, upon which surfacing is now being placed. As a unit of the south portion of this relocation a project for the construction of bridge and overhead crossing at Manzanita was advertised for bids on October 29th. This structure will cross the tracks of the Northwestern Pacific Railroad and an arm of Richardson's Bay. The bridge and overhead will consist of a 56-foot plate girder lift span on concrete piers with pile foundations, a 45-foot steel stringer span on concrete bents with pile foundations and 2340 feet of timber trestle on pile and frame bents; the roadway will be 44 feet wide and paved with asphalt concrete. The cost of these two projects will be approximately $560,000. This new routing between San Rafael and Sausalito will avoid the narrow and crooked Corte Madera grade and materially shorten the distance between these two points.

BID OPENINGS

Other important projects for which bids have been opened during the past four weeks include the following:

Cholame Lateral.

The construction of a graded roadbed 36 feet wide and Portland cement concrete paving 20 feet wide on the Cholame Pass lateral at the grade separation near Wasco in Kern County will cost $26,000. The steel and concrete separation structure is now being built by the Atchison, Topeka and Santa Fe Railway and the state will construct the highway through the subway. This project will be a marked improvement on this portion of this lateral which connects the Coast Road at Paso Robles with the Los Angeles-Sacramento highway at Famosa, just to the north of Bakersfield.

Bay Shore Highway.

Further progress on the new Bay Shore Highway which is being built between San Francisco and San Jose as an alternate route to the coast road down the peninsula, is evidenced by the opening of bids for the construction of a reinforced concrete girder bridge across Redwood Slough at Redwood City. The structure will connect the newly constructed roadway from San Mateo to Redwood City with the section now under construction, between Redwood City and Willow road.

A project of the first magnitude will be the erection of a steel cantilever bridge across the North Fork of the Feather River at Pulga in Butte County. Bids for placing the concrete piers and abutments were opened on November 19th, and advertising for the erection of the steel superstructure was published as the fifth of November. These projects will complete a unit of the Oroville to Quincy lateral, which is being constructed up the Feather River Canyon. Grading of the adjoining roadway to the south of this crossing is now under way along the precipitous wall of the canyon. The deck of the highway bridge will be 170 feet above high water and 130 feet above the top of the Western Pacific Railroad bridge which passes diagonally under the state's proposed structure. The project for the substructure calls for placing two reinforced concrete abutments and two reinforced concrete piers. The erection of the superstructure will include one 350-foot steel arch span, two 62-foot plate girder spans, and one 44-foot plate girder span. The roadway width of the bridge will be 24 feet. At a cost of $280,300 another link will be added to this new all-year highway to Quincy and Plumas County.

PROJECTS ADVERTISED

Advertisements for the past period also include the following projects:

El Centro-Yuma Highway.

Construction on six miles of the transcontinental highway which enters California via Yuma, Arizona, will consist of grading a roadbed 36 feet wide and placing 20 feet of asphalt concrete pavement between the Colorado River bridge at Yuma to Arizona in Imperial County. This project will be a much needed

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Progress on State Highway System

MAJOR PROJECTS COMPLETED, UNDER WAY AND ADVERTISED, AS OF FEBRUARY 1, 1931—OTHER ACTIVITIES OF DEPARTMENT

C. H. PURCELL, Chief of Division of Highways.

PROGRESS REPORT FOR THE MONTH

The following statement indicates the progress of state highway work for the portion of the current month up to January 22d:

Work placed under contract	$947,400
Contracts pending and advertised	867,500
	$1,814,900
Work anticipated to be advertised during the coming month	3,817,400

CONTRACTS COMPLETED, PROJECTS ACCEPTED

During the past month nearly twenty major contracts have been completed and accepted for the Division of Highways. Included in these contracts were the following:

San Diego–El Centro Highway—Just west of Ogilvie Wells in Imperial County a new steel and concrete subway has been constructed under the tracks of the San Diego and Arizona Railroad on the new alignment of this lateral, made after the cloudburst in 1926, which completely destroyed the old road.

Coast Route—An improvement on the Coast Route is noted by the construction of a new bridge across Nojoqui Creek, in Santa Barbara County. This new structure is built on a new alignment of the highway at this point and replaces the old narrow structure built many years ago by the county on an alignment which was dangerous to present high speed traffic.

Valley Route—The widening and paving of the eight miles between Fowler Switch Canal and Fancher Creek on the Valley Route just south of Fresno has been completed. The improvement cost $363,200 and was carried through the town of Fowler.

Bayshore Highway—Progress on the Bayshore Highway, in San Mateo County, is seen with the completion of the final stage of construction on the five miles between South San Francisco and Burlingame. A 40-ft. Portland cement concrete pavement was laid on the graded roadbed which was completed about two years ago, extending from the grade separation under the S. P. tracks in South San Francisco to Broadway in Burlingame where it connects with the recently completed pavement between Burlingame and San Mateo. Pavement is now being placed on the portion of the route through South San Francisco. The present project was constructed at a cost of $436,400.

Tiburon Work—An improvement of interest to motorists of the bay area is the reconstruction of the State highway from the ferry slip at Tiburon to the Belvedere railroad crossing in Marin County.

McDonald - to - the - Sea Highway—In Mendocino County three short sections of the State highway, which extends from the Redwood Highway at McDonald, just north of Cloverdale, to the coast at Navarro Head, have been graded and surfaced with untreated crushed rock on improved alignment and grades.

Victory Highway—Another unit in the reconstruction of the trans-Sierra highway which leads from Central California to Reno via Auburn and Truckee, is added by the completion of the overhead grade separation at Yuba Pass in Nevada County. The new structure will eliminate the use of the present dangerous grade crossing near Crystal Lake.

Feather River Bridge—A project of widespread interest which has been completed and accepted during the past period, is the 500 foot bridge across the Feather River and the Western Pacific R. R. tracks, about 4½ miles east of Oroville in Butte County. This bridge is a unit in the construction of the new all year Oroville to Quincy lateral which will follow the Feather River Canyon.

Shasta Canyon Bridge—The second of five bridges to be constructed on the new alignment of the Pacific Highway between Yreka and the Klamath River, in Siskiyou County, has been completed at a point 5½ miles north of Yreka. Construction on the remaining three bridges and the grading of the roadway is being pushed forward and all work should be completed on this section by the beginning of summer.

Trinity River Bridge—A large steel bridge has been erected on the Eureka–Redding lateral across the South Fork of the Trinity River about two miles west of Salyer in Humboldt County.

LIST OF HIGHWAY BIDS AND AWARDS

For month of January

IMPERIAL COUNTY—Bet. Trifolium Canal and Kane Springs, grading and surfacing with asphalt concrete 6.3 miles. Dist. VIII, Rt. 26, Sec. B., Clark and Henery Const. Co., San Francisco, $159,523; Steele Finley, Santa Ana, $143,845; Basich Brothers, Torrance, $158,285; R. E. Hazard Const. Co., San Diego, $151,638; Daley Corporation, San Diego, $181,926; Southern Calif. Road Co., Los Angeles, $162,613; Contract awarded to Griffiith Company, Los Angeles, $142,323.

LOS ANGELES COUNTY—Widening Topango Creek Bridge, eight 27-foot timber spans and Las Flores Creek bridge, two 26-foot concrete spans and

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improved highway through Kern and Inyo Counties to recreational areas of the Sierra Nevadas with the hazards of desert travel minimized and distance and time materially decreased. The section just completed passes through the wierd and scenic Red Rock Canyon, a favorite winter recreation spot for many people from Southern California cities. This project was completed at a cost of $277,900, much attention being given to desert drainage problems and protection of the roadbed from damage by cloudbursts.

Walker Pass Highway: The progress on another State Highway, in Kern County, which leads into the Owens Valley is noted by the completion of a contract for placing an 18-foot oil treated crushed rock surface on 14 miles of the Kern River Road between Cottonwood Creek and Democrat Springs. This surfacing cost $147,800. The Kern River Road extends from Bakersfield to the Owens Valley via Walker Pass. The present improvement completes the surfacing of this road from Bakersfield to Democrat Springs. Until the time when this road is adequately constructed through the pass the bulk of traffic will remain recreational in character, travel being between Bakersfield and the various resorts in Kern River Canyon.

Redwood Park Highway: The construction of a graded roadbed 24 feet wide on two and a half miles of the beautiful mountain road which traverses California Redwood Park in Santa Cruz County was completed at a cost of $136,600. This work was located between Waterman Switchback and Saratoga Gap and it is planned to complete the grading and surface the entire distance between these two points this year. Recently completed construction on the Skyline Boulevard and its lateral connections makes this Redwood forest accessible to one and one-quarter million people within less than three hours driving time.

Bay Shore Highway: The continued progress on construction of the Bay Shore Highway is noted by the completion of the paving with 40 feet of Portland cement concrete that portion of this route through South San Francisco. The five miles immediately south of this project was recently paved and the distance from Broadway in Burlingame to Fifth Avenue in San Mateo will be advertised for bids in the near future. The cost of the paving through South San Francisco amounted to $103,500. Another step in pushing this alternate route down the peninsula from San Francisco to San Jose is accomplished by the advertising on February 11th of a project for the construction of a reinforced concrete girder bridge composed of three 27-foot spans and having a clear roadway width of 100 feet. This new structure will connect San Mateo and Santa Clara Counties by spanning San Francisquito Creek at Palo Alto.

BID OPENINGS

Bids were opened during the past four weeks on the following projects:

National Old Trails: The continued improvement of the trans-continental highway which enters California at Needles is noted by the opening of bids for the construction of a graded roadbed 36 feet wide and placing an oil treated crushed rock surfacing 20 feet wide along a new alignment 29 miles long between Essex and one mile south of Klinefelter. The cost of this section of this desert road will be $548,000. A reinforced concrete overhead crossing over the tracks of the Santa Fe Railroad about two miles east of Essex was advertised for bids on February 11. Work on this route has been steadily pushed eastward from San Bernardino and by the completion of the present project, this desert highway will present a modern standard of alignment and grade from San Bernardino to 11 miles from Needles.

Valley Highway: Bids for the reconstruction of nearly eight miles of the Los Angeles to Sacramento Highway, between Stockton and Houston School were opened on February 21, 1931. This project calls for the placing of a Portland cement concrete pavement 20 feet wide and widening the roadbed to 36 feet. The pavement will be placed on the graded roadway between Stockton and Cherokee Station which was constructed on a revised alignment in 1927. At Cherokee Station this improvement will connect with the southerly end of the recently completed seven miles of concrete pavement between Cherokee Station and Harney Lane. From Harney Lane, through Lodi to Houston School, the old county road is to be regraded and paved with Portland cement concrete. With the completion of this project, which will cost $284,[illegible] this important arterial will present a wide, modern high-speed highway from Stockton to Sacramento.

HIGHWAY BIDS AND AWARDS FOR MONTH OF FEBRUARY

COLUSA COUNTY—Between Maxwell and [illegible] north boundary, 1.5 miles to be surfaced with pit run gravel. Dist. III. Rt. 7, Sec. C. A. Teichert & Son, Sacramento, $12,446; D. McDonald, Sacramento, $11,049; contract awarded to Harms Bros. Co., $9,715.

PLUMAS COUNTY—Between Paxton's and [illegible]die, 0.7 of a mile to be graded (line change), Dist. II. Rt. 21, Sec. B. F. C. Coats, Sacramento, $52,0[illegible] Hemstreet & Bell, Marysville, $51,433; Larsen Bros., Galt, $55,200; Granfield, Farrar and Carlin, San Francisco, $61,810; Finnell Co., Sacramento, $53,[illegible] H. H. Boomer, San Francisco, $69,966; Young & Son, Berkeley, $64,129; Chigris & Sutsos, San Francisco, $52,968; W. H. Hauser, Oakland, $51,518; Chas. S. Chittenden, Napa, $67,753; contract awarded to Morrison-Knudsen Co., Boise, Idaho, $48,791.

SAN BERNARDINO COUNTY—Between 1½ miles east of Essex and 1 mile SW. of Klinefleter, grading and oil surfacing. Dist. VIII. Rt. 58, Sec. L[illegible] Jahn and Bressi Construction, Los Angeles, $557,41[illegible] George Herz & Co., San Bernardino, $521,325; Allen Contractors, Inc., Omaha, Nebraska, $692,067; K. E. Knapp, Oakland, $554,073; Isbell Const. Co., Carson City, Nevada, $599,084; New Mexico Construction Co., Albuquerque, N. M., $644,603; Hemstreet & Bell, Marysville, $606,687; Merritt-Chapman & Scott Corporation, San Pedro, $559,814; A. Teichert & Son, Inc., Sacramento, $567,324; Contract awarded to H. W. Rohl Co., Los Angeles, $496,246.

SONOMA COUNTY—About 4½ miles north of Santa Rosa, timber bridge across Mark West Creek, consisting of six 19-ft. spans, two 16-ft. spans, surfaced with Portland cement concrete approaches and bridge. Dist. IV, Rt. 1, Sec. B. A. T. Howe, Santa Rosa, $22,743; W. C. Colley, Santa Rosa, $23,455; Ralph Hunter, Sacramento, $19,551; Fred J. Maurer, Eureka, $22,255; Smith Bros., Eureka, $22,791; J. W. Hooper, Sacramento, $21,287. Contract awarded to Peter McHugh, San Francisco, $19,366.

SAN JOAQUIN COUNTY—About 7.7 miles to be graded and paved with Portland cement concrete between Stockton and ½ mile north of Houston School (two sections, part between Stockton and Lodi and the other between Lodi and Houston School). Dist. X, Rt. 4, Sec. C-D. Clark & Henery Co., San Francisco, $274,521; N. M. Ball, Porterville, $264,[illegible] Fredrickson & Watson Const. Co., Oakland, $264,[illegible]

May 1931

Governor Rolph Opens New Unit of Bayshore Highway

By Colonel Jno. H. Skeggs, District Engineer

A MOST IMPORTANT LINK, in so far as the traveling public is concerned, of the Bayshore Highway, between San Mateo and Redwood City, was formally dedicated to the public by Governor Rolph, who made a special trip from Sacramento for the occasion, on the 14th day of May, 1931.

Present with the Governor were Colonel Walter E. Garrison, State Director of Public Works, and C. H. Purcell, State Highway Engineer, from Sacramento; State Highway Commissioner Timothy A. Reardon of San Francisco and Colonel Jno. H. Skeggs, District Engineer, under whose supervision the work had been completed.

Prior to the formal dedication, a group of public spirited organizations and citizens of Redwood City gave a luncheon at Emerald Lake for their honored guests; after which the assemblage proceeded to the south end of the new highway at Redwood City, where a parade of the school children of this city took place—reflecting the interest not only of present citizenship, but of the future leaders of this wide-awake community in this highway achievement. The ceremonial, in which the Governor cut the ribbon for formal opening of this 7.4-mile section of the Bayshore Highway, was started at 2 p.m.

Previous to the construction and opening of this section between San Mateo and Redwood City, the Bayshore Highway served as a fast interurban artery to a terminus at Fifth avenue in San Mateo, at which point all travel to the south was forced to proceed to the Peninsula Highway, causing great congestion and the inconvenience to motorists of cross traffic through the towns of San Mateo, Redwood City, Menlo Park and Palo Alto.

RELIEVES CONGESTION

The opening of the new link, however, by connecting at Redwood City with Washington Street and the Middlefield Road, an excellently paved county highway, gives the motorist assurance that he can travel from the heart of San Francisco to Palo Alto, or East Bay points via the Dumbarton Bridge, without being forced into the overburdened Peninsula Highway at any point. Thus, all the heavily settled urban territory in the twelve-mile strip of the peninsula between San Mateo and Palo Alto is given the advantage of two arterial highways into San Francisco.

CONSTRUCTION DIFFICULTIES

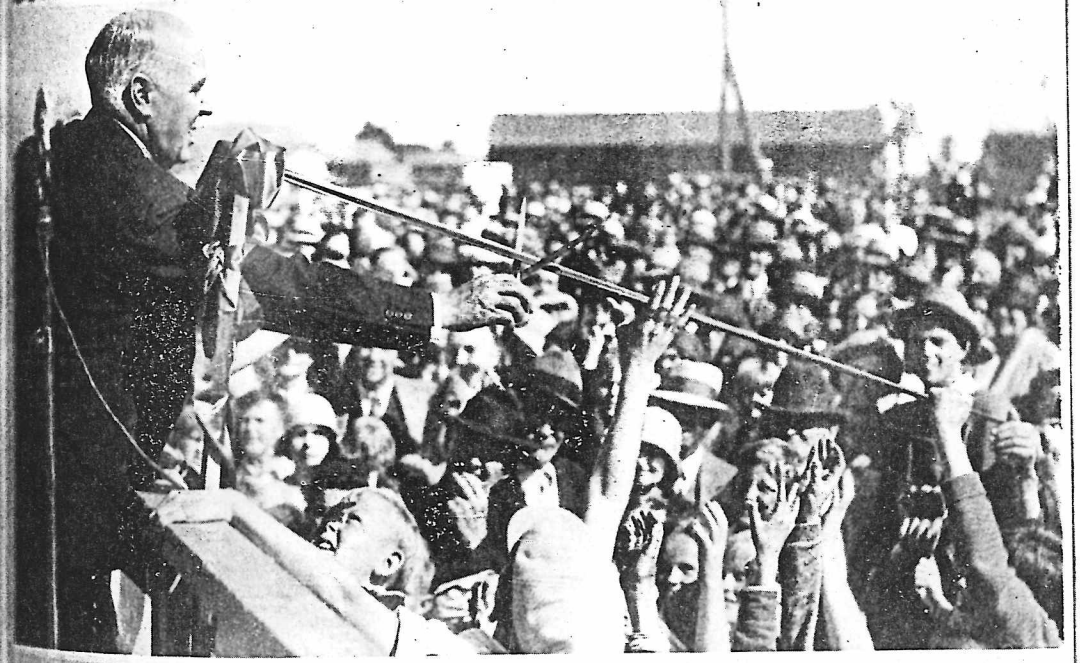
The difficulties of constructing this important strip of highway were many, due to the fact that it traverses for almost its entire length the marshes and the many salt ponds of this territory, where gradual settlement of the roadbed can normally be expected for some years to come. That section of the Bayshore Highway between South San Francisco and Burlingame, which traverses a terrain similar to that of the new section, was first graded in 1924; but, due to gradual settlement, was not considered ready for heavy type concrete pavement until 1930. The first four miles of the new section—namely, between San Mateo and Belmont—were constructed entirely of fill material obtained from the rocky knoll located at Belmont, just west of the Bayshore Highway and south of Harbor Boulevard. The last three miles were constructed by pumping in material from the bay adjacent to the highway between previously constructed levees, a blanket fill, however, of two feet in thickness of the material from Belmont Hill being placed over the hydraulic fill.

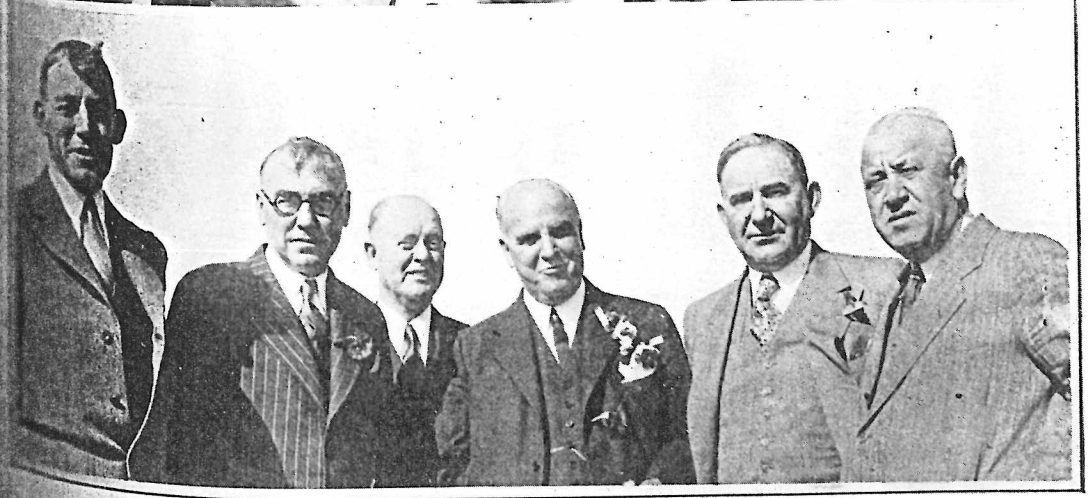
The cost of this section of highway was $450,000 for grading and $135,000 for rock base and temporary surfacing, bringing the total expenditures to date upon the twenty miles of the Bayshore Highway now open to traffic, from the county line at San Fran-

(Continued on page 40.)

PICTURES ON OPPOSITE PAGE

Top Picture—Governor Rolph is greeted by delegation of peninsula women; center—Governor Rolph cutting the ribbon, formally opening the Bayshore Highway from San Mateo to Rewdood City; lower—Colonel John H. Skeggs, District Engineer headquarters, San Francisco; C. H. Purcell, State Highway Engineer; Mayor Stafford of Redwood City; Governor James Rolph Jr.; Colonel Walter E. Garrison, Director of the Department of Public Works; and Timothy A. Reardon, member of the California Highway Commission.





ON OPPOSITE PAGE

Governor Rolph is greeted by peninsula women; center, cutting the ribbon, formally opening the Highway from San Mateo City; lower—Colonel District Engineer headquarters, C. H. Purcell, State Engineer; Mayor Stafford of San Francisco, Governor James Rolph Jr.; Clarence Garrison, Director of Public Works; and Timothy Hopkins, member of the California Highway Commission.

NEVADA COUNTY—Lower Rock Dam No. 97-38. Pacific Gas and Electric Company, San Francisco, owner; earth and rock dam, situated on Texas Creek tributary to South Yuba River in Sec. 15, T. 18 N., R. 12 E., M. D. B. and M.

NEVADA COUNTY—Upper Lindsay Lake Dam No. 97-46. Pacific Gas and Electric Company, San Francisco, owner; earth and rock, situated on Texas Creek tributary to South Yuba River in Sec. 21, T. 18 N., R. 12 E., M. D. B. and M.

NEVADA COUNTY—Upper Rock Lake Dam No. 97-48. Pacific Gas and Electric Company, San Francisco, owner; earth and rock dam, situated on a small creek tributary to South Yuba River in Sec. 15, T. 18 N., R. 12 E., M. D. B. and M.

SHASTA COUNTY—Coleman Forebay Dam No. 97-87. Pacific Gas and Electric Company, San Francisco, owner; earth and rock dam, located in Sec. 32, T. 30 N., R. 2 W., M. D. B. and M.

NEVADA COUNTY—Culbertson Dam No. 97-17. Pacific Gas and Electric Company, San Francisco, owner; earth and rock dam, situated on Texas Creek tributary to South Yuba River in Sec. 15, T. 18 N., R. 12 E., M. D. B. and M.

ARCHITECTURAL AWARDS
For Month of April

SAN DIEGO STATE TEACHERS COLLEGE—Club Building and Scripps Cottage; to H. Mayson, Los Angeles, $20,958.

AGRICULTURAL PARK (State Fair Grounds), Sacramento—General work on Poultry Building, to Guth & Fox, Sacramento, $48,826; for electrical work, to J. W. Thomas, Sacramento, $1,750; for plumbing work to Carpenter & Mendenhall, Sacramento, $5,974.

CALIFORNIA POLYTECHNIC SCHOOL, San Luis Obispo—General work on Boys' Dormitory No. 4, to Wigg Construction Co., Redondo Beach, $23,195; for plumbing work to American Engineers & Contractors, Los Angeles, $3,169; for heating work to W. A. Aschen, Oakland, $2,629; for electrical work to Electric Company, Santa Barbara, $1,164.

FOLSOM STATE PRISON—Mechanical equipment for four sewage aerators to Water Works Supply Company, San Francisco, $6,000.

DISTRICT FIVE OFFICE BUILDING, San Luis Obispo—General work to H. J. Smith, San Luis Obispo, $21,939; for plumbing work to Carl T. Doell Company, Oakland, $2,654; for heating work to Thomas Haverty Company, Los Angeles, $2,342; for electrical work to California Electric Company, Santa Barbara, $1,196.

NORWALK STATE HOSPITAL—Quarters for Night Attendants, Quarters for Day Attendants and Assistant Physician's Residence—For general work to C. Haverlandt, Long Beach, $53,861; for plumbing and heating to Coony & Winterbottom, Los Angeles, $11,124; for electrical work to R. R. Jones Electrical Company, Pasadena, $2,520.

Census Taker: "What is your husband's name?"
Mrs. Murphy: "Pat."
Census Taker: "I want his full name."
Mrs. Murphy: "Well, when he's full, he thinks he's Gene Tunney."

Here's how the average man spends his "three score and ten":

Sleeps 23 years and four months. Works 19 years and eight months. Plays and prays ten years and two months. Eats and drinks six years and ten months. Dresses and undresses two years. Travels four years. Sick and convalesces four years. Total, 70 years.—*Exchange.*

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California, published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

COLONEL WALTER E. GARRISON.....Director
GEORGE C. MANSFIELD.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 9 MAY, 1931 No. 4

GOVERNOR ROLPH OPENS NEW UNIT OF BAYSHORE HIGHWAY

(Continued from page 2.)

cisco to Redwood City, to nearly $4,000,000. These figures are exlusive of the construction of the Bayshore Boulevard within the city limits of San Francisco, which gives access to the heart of the city at almost any point desired.

BRIDGE COMPLETED

The bridge across Redwood Slough, at Redwood City, has been completed. A bridge across San Francisquito Creek, the county line between San Mateo and Santa Clara counties, is now being constructed; and an underpass under the Dunbarton branch of the Southern Pacific Railway will be under construction inside of a few weeks. The surfacing of the section between Redwood City and Willow Road—the latter being the county highway connecting to the Dunbarton Bridge a short distance east of the Bayshore Highway—and the grading and suurfacing between Willow Road and Oregon Avenue will be commenced this summer for early completion, at which time there will be another seven-mile strip opened to the use of the traveling public.

PURPOSE OF ROAD

The Bayshore Highway has been designed for the primary purpose of fast express travel between the cities of San Francisco and San Jose, and for this reason it skirts the edge of the bay by passing the business sections, in so far as possible, of all cities and towns along its route. However, the construction of the new Western Pacific line east of this highway into San Francisco, and the consummation of harbor facilities and developments already in progress, or contemplated for the near future, will assure the rapid industrial development of the entire section which this important highway traverses.

May 1932

Highway Division Plays Large Part in Welcoming Akron to Sunnyvale

THE U. S. NAVY Dirigible Akron, arriving at Sunnyvale Air Base on her maiden voyage to the coast found that the State Department of Public Works through its Division of Highways had taken a leading part in arranging a rousing welcome for her by eager thousands of patriotic Californians.

A newly completed link of the Bayshore Highway running past the southerly side of the air base gave a vast multitude of motorists and pedestrians opportunity for a spectacular view of the great naval airship slowly descending to her anchorage and a close-up of her tremendous bulk as she floated at her mooring mast close to the highway.

This short stretch of modern standard highway, rushed to completion under the supervision of Col. Jno. H. Skeggs, District Engineer, is a link of the Bayshore Highway being built by the State between San Francisco and San Jose. It was designed to accommodate the sightseeing crowds that will visit the great Akron at anchor in her home port. It is 1.2 miles long providing a 60-foot roadway on a 150-foot right of way, ample to eventually provide a 100-foot roadway with parking area along each side. It has been given a temporary light fuel oil surface for immediate traffic needs.

MAJOR TRAFFIC PROBLEM

The naval officials at Sunnyvale were considerably concerned about the handling of traffic after the dirigible had been anchored at her mooring mast, having had considerable experience with this problem in the East where, they stated, the traffic congestion at the Lakehurst hangar, when the Graf Zeppelin was moored there, had taken three days to untangle.

However, the State Division of Highways had anticipated such a problem and the California Highway Patrol worked out a traffic plan that would permit all machines to pass the air base and view the Akron without serious congestion. The heavy flow of traffic began Friday, May 13th, and continued through Saturday, Sunday and Monday. At times, after dusk, there were seven lines of traffic abreast flowing past the air base.

2337 CARS IN HOUR

On Sunday, the Division of Highways took a traffic count which revealed 22,282 automobiles passing the air base in one direction in a 16-hour period, with a peak traffic of 2337 cars in one hour's time.

The very slow movement of vehicles prevented a great number of additional cars from entering the Bayshore highway. The cars were parked along various county roads and private property given over to parking while their occupants joined thousands of pedestrians standing along the south side of the Bayshore Highway, that being the direct line for pedestrian traffic.

The full benefits of these traffic achievements were apparent at the interesting dedicatory exercises held Saturday afternoon, May 14th, before a temporary speakers' stand erected near the Akron and attended by a vast throng of spectators.

Admiral Cole, Commander of the 12th Naval District told how the Naval Base was established and the great possibilities of the lighter-than-air dirigible which could be placed in civilian passenger traffic as well as naval activities.

AMAZING POSSIBILITIES

He described how easily the great ship Akron could leave New York and, as she approached Cleveland or Chicago, a small airplane could take on its load of passengers, rise, and contact the Akron at full flight, unload its passengers and then drop from the Akron and return to its local base. The Admiral's description of this particular phase elicited a great cheer from the thousands present.

Lieut. Commander Charles E. Rosendahl, Commander of the Akron, briefly described the entire trip from the Atlantic to the Pacific coast, with all the phases of the flight through storms, to San Diego, and its trip up the California coast to Sunnyvale. He too, expressed the great possibilities of dirigibles for long commercial flights, especially over seas. Hon. Louis Oneal of San Jose, representing Governor Rolph, briefly described the work of the various chambers of commerce of the San Francisco Bay re-

(Continued on page 29)

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37 CARS IN HOUR

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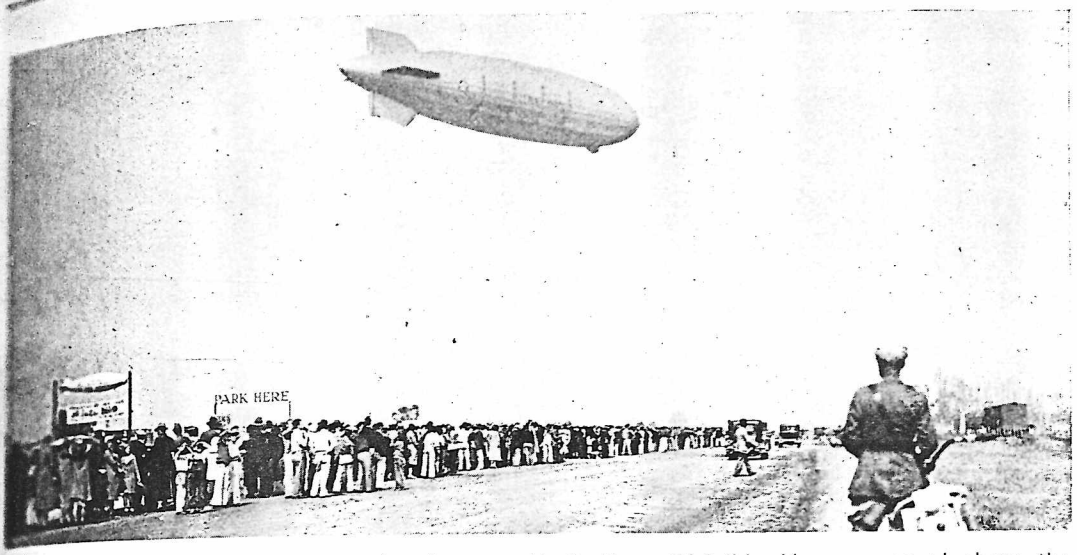
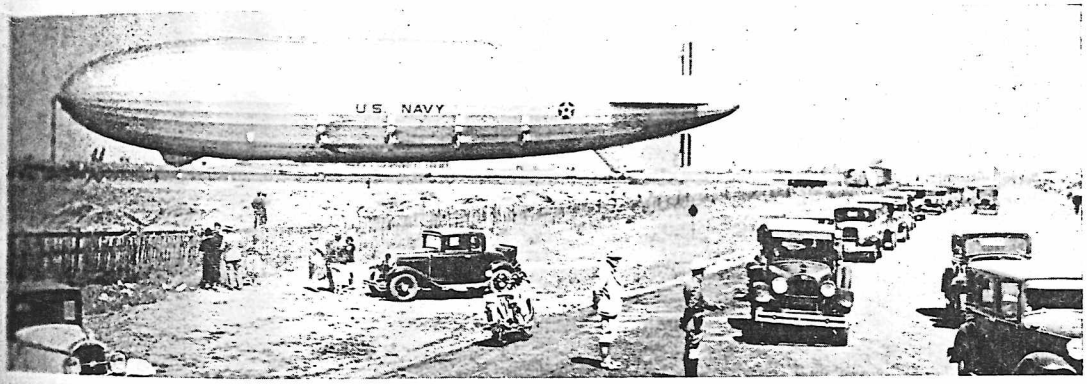
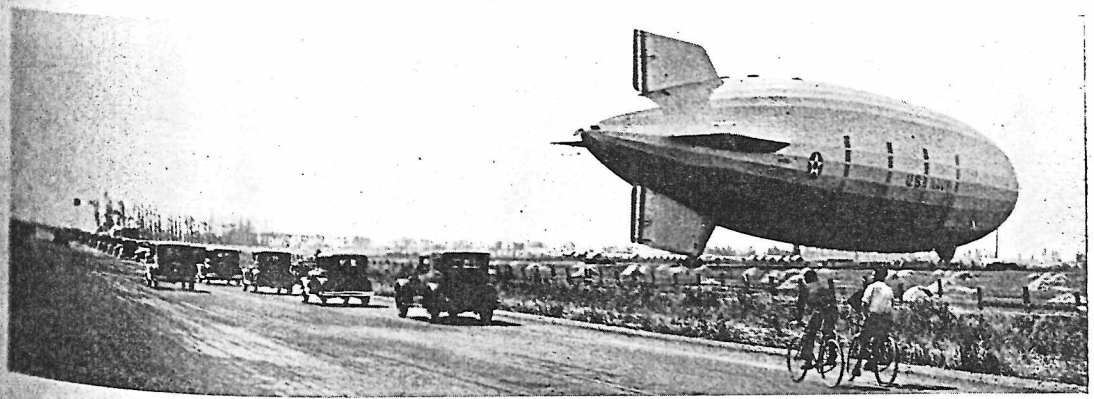


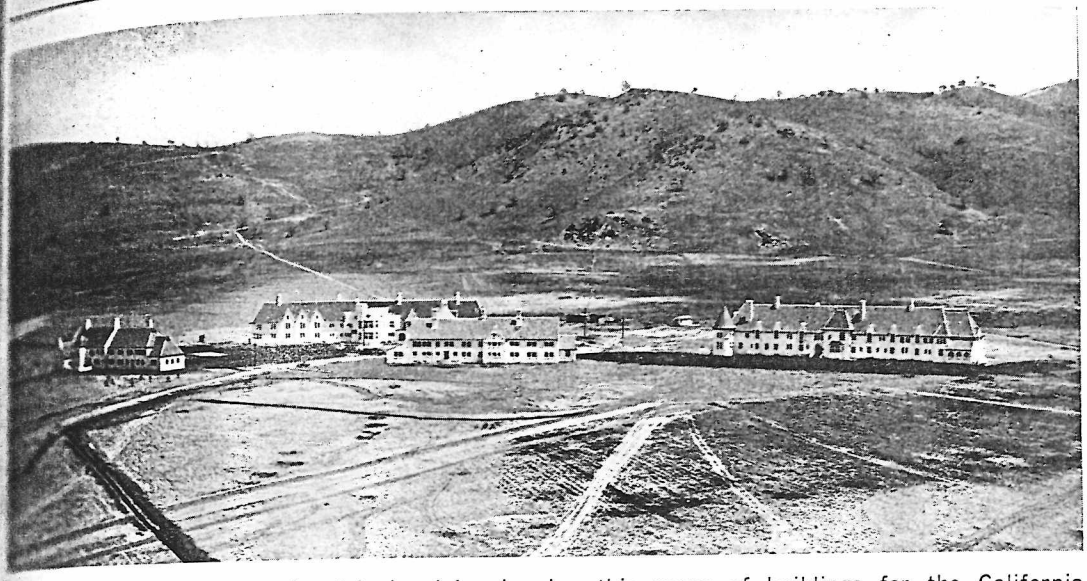
OUT OF THE MISTS of the morning the great U. S. Navy Dirigible Akron appeared above the newly completed link of the Bayshore Highway that passes the Air Base at Sunnyvale affording a vantage point for thousands of motorists and pedestrians who gathered in the early dawn to greet her.



THE PASSING PARADE that numbered 22,282 automobiles in sixteen hours obtained a spectacular view of the new leviathan of the skies as she lay at her anchorage close to earth just off the wide new highway built to give easy access for thousands of citizens who will visit the ship.



A CLOSE-UP picture of the monster dirigible reveals how her huge bulk, 785 feet in length, extends from the mooring mast almost to the new highway where her rudders and elevator fins loom high above the stream of cars. One-way traffic is the rule and the spacious highway permitted autos to roll seven abreast Sunday evening.



ART AND HEART went hand in hand in planning this group of buildings for the California Institution for Women, located in Cummings Valley near Tehachapi, Kern County. Housed in these spacious, well equipped structures of Norman architectural design, women heretofore crowded in San Quentin will be rehabilitated for their return to society. The large Dentention Building and two dormitory cottages are at the left of the group with the Administration Building at right. This air-view was taken by the 115th Photo Section, Fortieth Division Aviation, California National Guard, Griffith Park, Los Angeles.

State Highway Link Gives View of Akron

(Continued from page 2)

in their endeavor to secure the Sunnyvale dirigible site for California.

VISITORS INVITED

Concluding the dedication Admiral Cole stated it was desirable to have all civilians enter the air base and view the great ship, as it was the pride of the American people and they should have every opportunity to see the benefits of the Navy's activities in aeronautics.

The total expenditure in this Sunnyvale link has been approximately $48,000. This amount, added to the total spent to date in constructing the Bayshore Highway between San Francisco and San Jose, approximates a total of $4,000,000. In addition to this sum there is now being expended an additional $36,000 to extend grading and paving of this important arterial highway from Redwood City to Palo Alto.

The Division of Highways will also contract, during the early summer, for further grading and paving of an additional unit of the Bayshore Highway from Palo Alto to the Lawrence Station Road in Santa Clara County.

Architect McDougall Making a Study Tour

GEORGE B. McDOUGALL, A.I.A., Chief of the Division of Architecture of the Department of Public Works has been sent East to make a study of the largest penal institutions and hospitals for the insane in the country.

Mr. McDougall's trip comes as the result of the recent selection of a site near Camarillo, Ventura County, that will ultimately be expanded into the largest hospital for the insane in the State with a capacity for 5000 patients. Governor Rolph, Dr. J. M. Toner, Director of Institutions, and Colonel Walter E. Garrison, Director of Public Works, decided that such a trip was necessary to secure the latest ideas for the design and construction of such a building and Daniel J. O'Brien, Director of Penology, urged that the itinerary be extended to take in prisons for ideas to be incorporated in the prison for first offenders to be built in the South.

Accordingly, the State Architect will visit twenty-one institutions in eleven cities and eight states, including New York, Boston, Chicago, Washington, D. C.; Alderson, West Virginia; Stillwater, Minnesota, and Tacoma, Washington.

Jul – Aug 1933

Bayshore Highway Now Presents a 35 mile Ribbon of 40 foot Pavement

By JNO. H. SKEGGS, District Engineer

THE Division of Highways recently completed another link in the Bayshore Highway leading past the U. S. Naval Dirigible Base near Sunnyvale. The long vision of civic and county leaders is now realized in the completion of this section of the Bayshore Highway, which, with the magnificent Naval Air Base alongside, stands as one of the great monuments to the advancement of the Bay Region.

This newly opened section of the bayshore improvement was accepted by the State June 12th. It extends from Oregon Avenue in Palo Alto to Lawrence Station Road, eight and two-tenths miles (8.2) almost as the crow flies with 40 feet of pavement. The new pavement is bedded on a base course of gravel a foot thick. Oil treated gravel shoulders 10 feet wide provide an overall roadway 60 feet wide.

Such is this latest completed section of the great Bayshore Highway, which now reaches from the heart of San Francisco to many connecting roads in Santa Clara County.

HIGH TYPE SURFACING

From the San Francisco County line to the extremity of this new unit, the distance is 35.08 miles, all of which has been provided with high type surfacing including a small section of three miles at South San Francisco finished and opened July 13.

Structurally the new pavement of Portland cement concrete is placed in two 20-foot lanes; in design, each 20-foot lane is in two 10-foot slabs. As far south as Charleston Road, between Palo Alto and Mountain View, the pavement slabs are 9 inches in thickness for the middle 6 feet, increasing to 11 inches at the edges.

From Charleston Road to Lawrence Station Road, pavement is 8 inches through the middle 6 feet of each slab, thickening to 10 inches at the edges. Of the 8-10 inch pavement, that portion from Whisman Road to Lawrence Station Road has welded wire-mesh type of reinforcement, and the balance of Portland cement concrete has the steel bar type of reinforcement.

On the 8.2 miles of Bayshore Highway south of Palo Alto, the contractor placed concrete at a rate of approximately 100 cubic yards in finished pavement each hour. On a six-hour day basis, this output produced a section of pavement 20 feet wide, 1033 feet long. This represents an efficiency improvement of about 500 per cent over similar work of 10 or 12 years ago.

At the same time, the present high standard pavement, of which this section is typical, is uniform in character; almost perfectly smooth in surface; and averages nearly 5000 pounds per square inch for compressive strength.

Withal, this high class pavement has been placed with a cost to the State of $5.90 per cubic yard.

The quality of California State Highway pavement has been improving constantly from year to year, and the cost of its production has steadily declined. This is due primarily to the high development of road building technique growing out of scientific studies and methods of work fostered by the State and carried out by those executing the work under precise specifications. This progression, in turn, is chiefly due to the constant and orderly support of trained State forces and contractors' organizations.

SALIENT FEATURES

Outstanding features of the Bayshore Highway are:

1. Its 125-foot right of way, which guarantees freedom from encroachment.

2. Direct alignment in which curvature is practically negligible.

3. Grades nearly level.

4. Location tribuary to and bordering communities whose growth it will serve completely.

These features apply to all of the Bayshore location. This new section, however, has over a mile of frontage along the great Naval Air Base at Sunnyvale, and lies generally on ground high enough for desirable home sites. In all probability, adjacent large holdings will subdivide for homes and small business as in the case of sections between Redwood City and Palo Alto.

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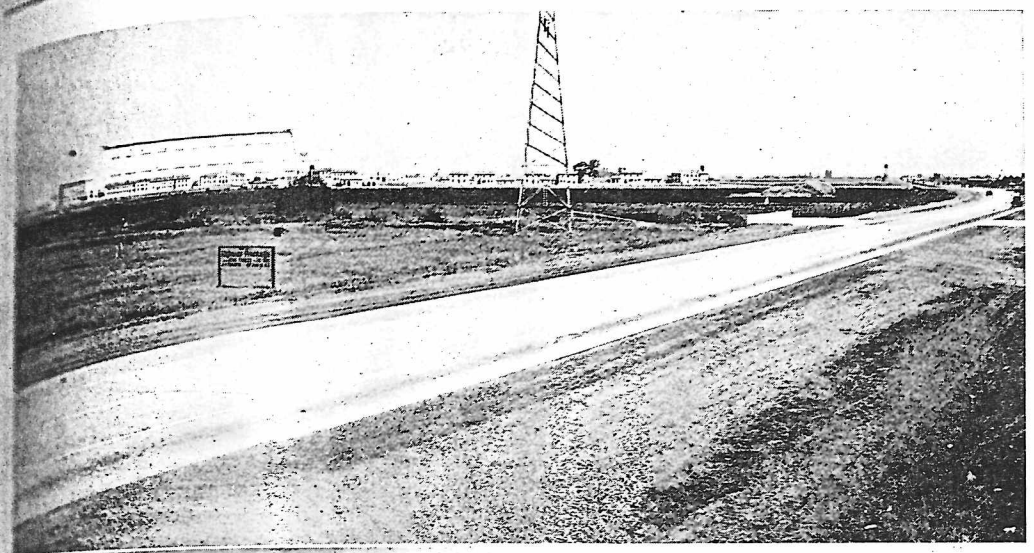
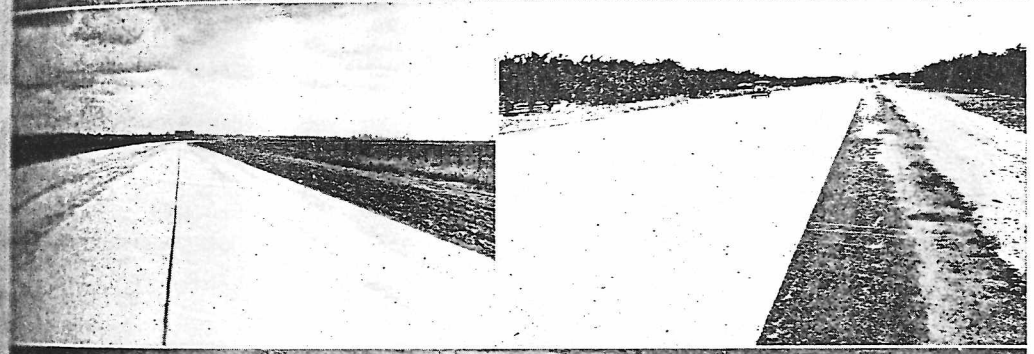
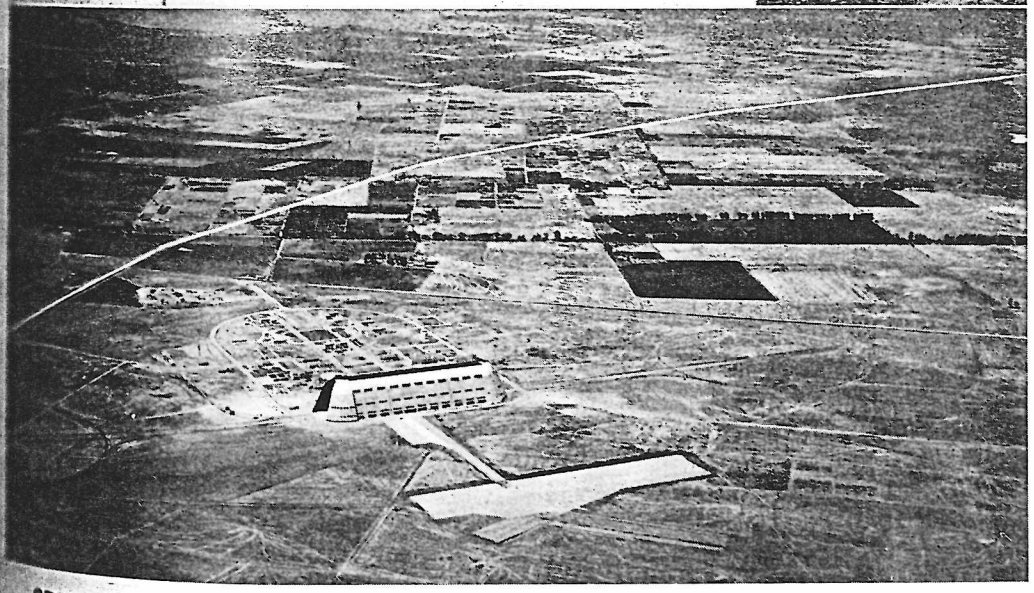






SPEEDING TRAFFIC on its way to and from the heart of San Francisco along the bay side of the Peninsula, the Bayshore Highway has been lengthened by another link of fine wide concrete pavement extending 8.2 miles south from Sunnyvale Air Base. At top—Panorama showing the highway and the Navy's great dirigible hangar and airbase city in the background. In center—Typical sections of the four-lane pavement leading past fields and orchards. At bottom—A striking airview that depicts the highway stretching like a long white ribbon across the country past airbase and hangar in the foreground.

Bayshore Highway Aiding in Developing Community Growth

(Continued from page 24)

The general conditions are such that this great arterial will, on the one hand, promote an orderly expansion of community development, and on the other hand remain free from those hampering restrictions which such growth often imposes upon the functions of a trunk-line highway.

Many interesting construction details were carried out in building the high type pavement from the Embarcadero at Palo Alto to Lawrence Station Road. The fact that this entire section was over new rights of way, where soil conditions were not of the best, required careful analysis of materials. A gravel pit was secured, from which most excellent sub-base material was obtained, and a blanket of this material was placed over the marshy ground and adverse adobe soils.

To those who are familiar with the topography and general appearance of this section of the Peninsula, a trip over this splendid new highway brings a thrill of surprise, if not bewilderment.

OPENS NEW VISION

Where a few months ago was grazing land, a magic city now stands—the Naval Air Base of the Pacific Coast. The enormous hangar can be seen for many miles in all directions, and even from San Francisco on a clear day. Adjacent marsh lands and bare grain fields have been transformed into a city of administration buildings, barracks, huge helium gas containers, power plants, machine shops, and scores of other buildings—like another Boulder City grown up over night.

Wonderful and continuous growth for this favored region is no extravagant vision when one sees the transformation already made and under way. In addition, construction of this latest Bayshore section, 8.2 miles long, has provided substantial relief for the burden of unemployment, and has made great advancement toward complete realization of the major objectives of this notable highway.

INVISIBLE

Suave Auto Salesman: It runs so smoothly you can't feel it, so quietly you can't hear it, has such perfect ignition you can't smell it, and as for speed—you can't see it.

Londoner: My word! How do you know the bally thing is there?—*Motor Land.*

Board of Architects Designing Concrete Masses of Bridge

Continued from page 13)

which is the most hazardous occupation in connection with bridge building.

An important feature of our work is the unification of our designs of huge concrete masses by the Board of Architects, consisting of Timothy L. Pflueger, Arthur Brown, Jr., and John J. Donovan.

The treatment which these architects are designing for the large blocks of concrete that will be visible above water and on land will make this bridge a thing of beauty to the residents of the bay region and those passing over the bridge.

We expect to announce in the near future the designs for these concrete masses.

TOWERS RISE IN 1934

Foundation work will occupy the balance of the year 1933 on this bridge with the exception of the island and anchorage work.

Early in 1934 steel construction on the first towers will be visible on the bay.

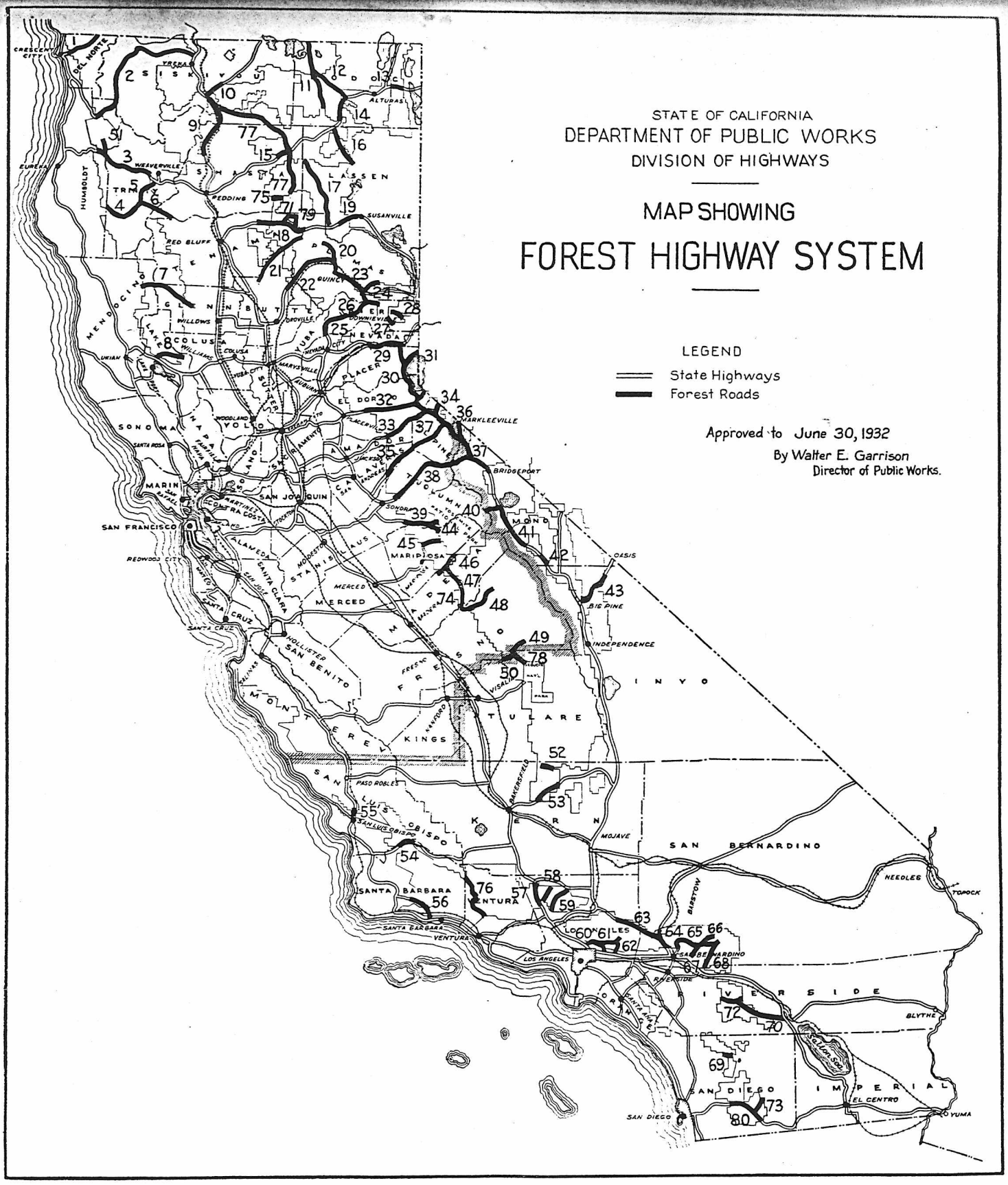
These towers will be completed in 1934 and the tremendously interesting task of spinning the cables will begin in 1935 and occupy all of that year until early in 1936.

By the middle of 1936 we estimate all the steel work to be completed, and by January 1, 1937, we expect to have the roadways laid and the bridge ready to be turned over to the California Toll Bridge Authority and opened to the public.

HIGHWAYS

Our State Highway Department has built some of the finest and most scenic highways in the world, and it should be encouraged in every possible manner. Roadways that the people dream of some day having in the middle west, our experts have built here. As much of their money as possible should be diverted away from them.

In Wisconsin they are proud of a mile or two of lakeshore highway at Milwaukee, while here in California we have miles of Pacific coast highway, especially near Santa Monica, Monterey and Santa Cruz. What other people dream of we have already accomplished out here.—*Hayward Review.*



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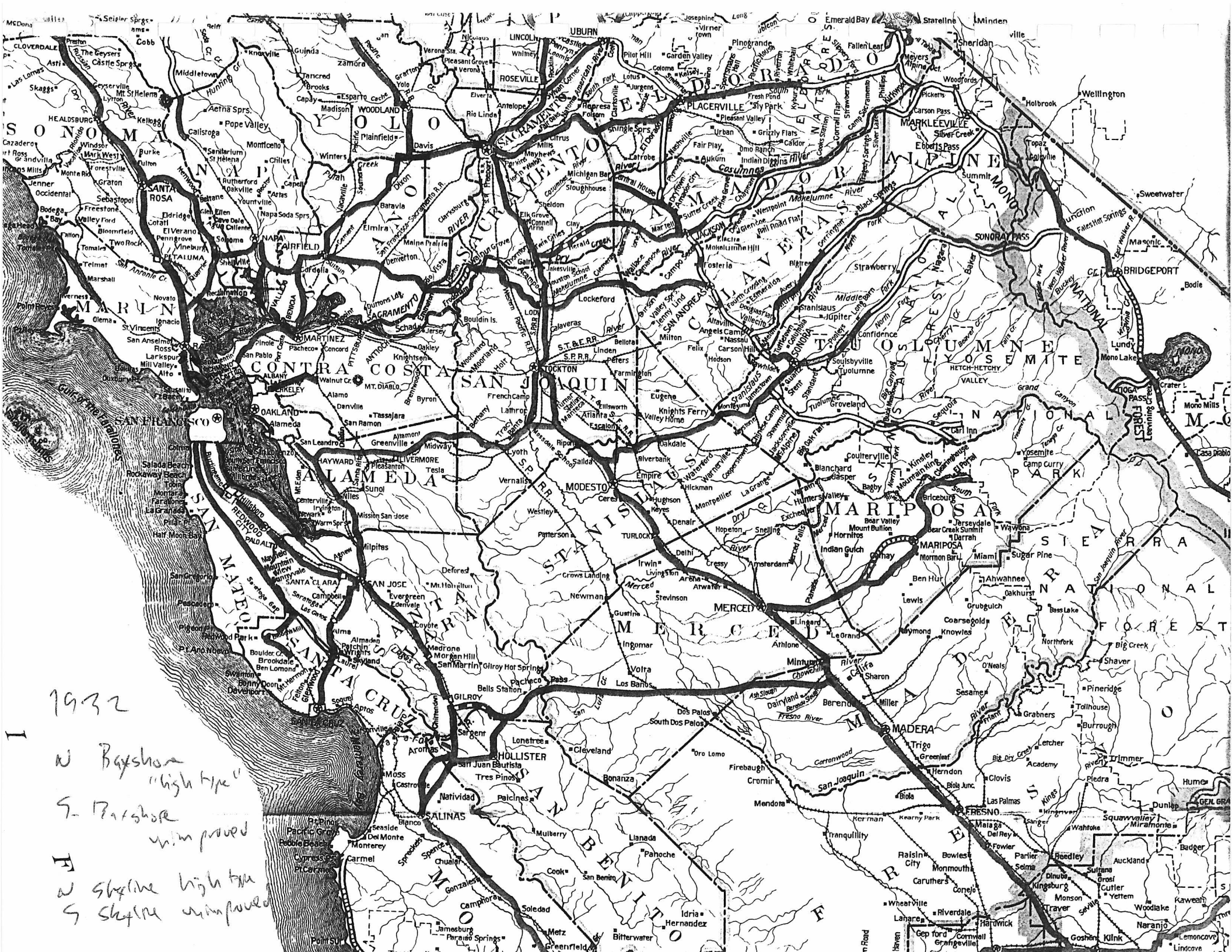

1932
N Bayshore "high type"
S Bayshore improved
N Skyline high type
S Skyline improved
SONOMA
NAPA
YOLO
SACRAMENTO
MARIN
CONTRA COSTA
SAN JOAQUIN
ALAMEDA
SAN MATEO
SANTA CLARA
SANTA CRUZ
STANISLAUS
MERCED
MARIPOSA
MADERA
FRESNO
EL DORADO
ALPINE
AMADOR
CALAVERAS
TUOLUMNE
MONO
SAN FRANCISCO
OAKLAND
BERKELEY
SAN JOSE
SANTA ROSA
PETALUMA
FAIRFIELD
VALLEJO
MARTINEZ
STOCKTON
MODESTO
TURLOCK
MERCED
HOLLISTER
SALINAS
MONTEREY
SAN BENITO
WOODLAND
DAVIS
VACAVILLE
ROSEVILLE
AUBURN
PLACERVILLE
SONORA
MARKLEEVILLE
BRIDGEPORT
MADERA
FRESNO
YOSEMITE
NATIONAL PARK
NATIONAL FOREST
Golden Gate
San Francisco Bay
Sacramento River
San Joaquin River
Lake Tahoe
Mono Lake
Pacific Ocean

1932

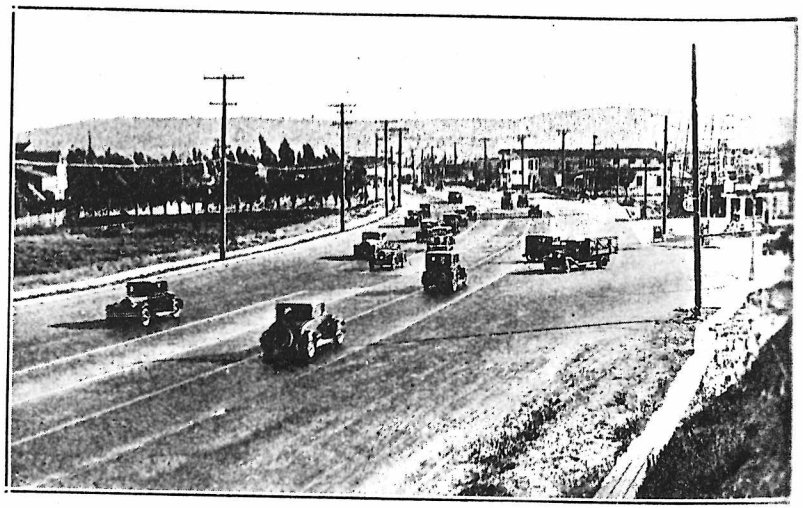
MILEAGE BY TYPES OF STATE HIGHWAYS CONSTRUCTED—JUNE 30, 1932

	Graded	Rock surfaced	Oil and bituminous treated surface	Bituminous macadam	Portland cement concrete	Asphalt concrete on macadam or bituminous base	Asphalt concrete on Portland cement concrete	Total
Primary Roads, North								
Constructed by state	63	61	706	149	795	55	215	2,04
Constructed by city or county			1	13	6		1	2
Subtotal, north	63	61	707	162	801	55	216	2,06
Primary Roads, South								
Constructed by state	57	7	515	29	505	108	235	1,45
Constructed by city or county				14	53	2	7	7
Subtotal, south	57	7	515	43	558	110	242	1,53
Total primary roads	120	68	1,222	205	1,359	165	458	3,59
Secondary Roads, North								
Constructed by state	97			64	118	3		75
Constructed by U. S. Bureau of Public Roads	90	109	362					11
Constructed by city or county	2		22	22	20	10		5
Subtotal, north	189	109	384	86	138	13		91
Secondary Roads, South								
Constructed by state	17							
Constructed by U. S. Bureau of Public Roads	3	10	140	74	17	9		26
Constructed by city or county	3		16					1
Subtotal, south	23	10	162	145	185	78	69	41
Total secondary roads	212	119	546	231	340	100	69	69
Grand totals	332	187	1,768	436	1,699	265	527	5,31

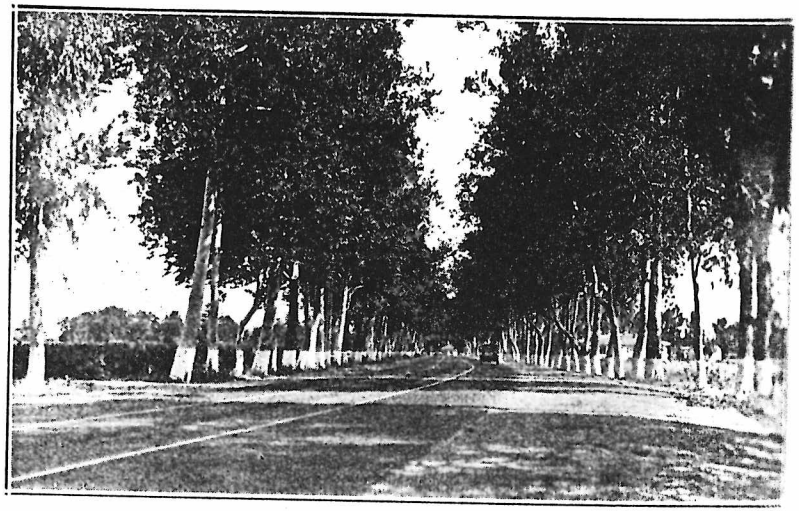
BRIDGE ACROSS GRANITE CREEK IN MONTEREY COUNTY ON CARMEL-SAN SIMEON HIGHWAY

BAY SHORE HIGHWAY AT NAVAL AIR BASE IN SAN MATEO COUNTY

1932



FOUR LANE PAVEMENT ON BAY SHORE HIGHWAY AT SOUTH SAN FRANCISCO



THREE LANE PAVEMENT WEST OF SAN JOSE IN SANTA CLARA CO.

The results of this cooperative study of the fifteen thousand grade crossings should be of undoubted value in leading to an understanding of the magnitude of the task of eliminating and protecting these traffic hazards and in setting forth practical methods of reducing the ever present danger at grade crossings.

CARQUINEZ TOLL BRIDGE REPORT

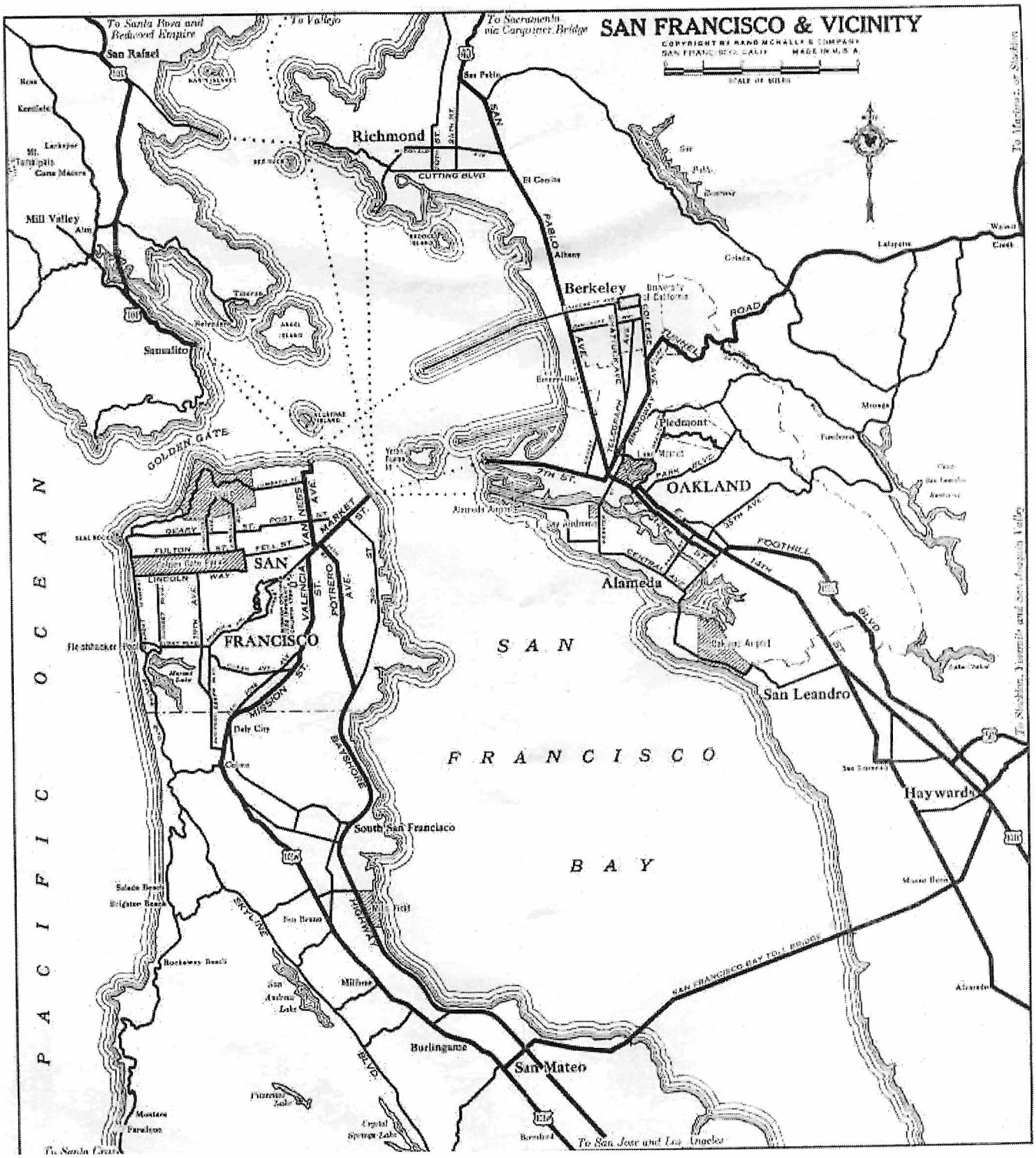
Acting under instructions to the California Toll Bridge Authority in Senate Concurrent Resolution No. 36 of the 1931 session of the State Legislature, the Division of Highways has conducted an exhaustive study of the toll bridge across the Carquinez Straits between Crockett and Vallejo. A report on the status of this bridge and a recommended procedure for the acquisition by the State of this privately operated structure will be submitted to the 1933 Legislature.

COOPERATIVE PROJECTS

Within the corporate limits of the 202 California cities on the state road system are 457 miles of city streets which are connecting links to State routes. This mileage represents 6 per cent of the total mileage of State highways without the limits of these cities. For many years the improvement of these connecting links was considered the responsibility of the municipality in which they were situated, but with the great increase of through traffic the California Highway Commission and the Department of Public Works have recognized the responsibility of the State for a share in the improvement of these streets. Under legislative authority, Chapter 463, Statutes 1931, a policy of cooperative participation in construction has been inaugurated for these portions of highway routings. Several miles of such routings within incorporated cities have been improved by State cooperation with local authorities during the past biennium and many more such projects are under agreement or are anticipated for the near future. In the budget for the eighty-third and eighty-fourth fiscal years, $2,750,000 was set up for this cooperative work, and it is anticipated that in the preparation of future budgets similar provisions will be made. By cooperative methods, continuity in the State system is obtained, travel is facilitated, and at the same time the local community benefits from a higher standard of improvement than the abutting property could afford.

JOINT ROADSIDE BEAUTIFICATION STUDY

Assembly Concurrent Resolution No. 34, adopted by the 1931 State Legislature, directed the Division of Highways and the Division of Parks, with the aid of the regional office of the U. S. Bureau of Public Roads, to make studies and to formulate a suitable plan through which the three agencies might supply a definite leadership in roadside beautification and development of roadside parking and recreational areas. This cooperative study has been made and a report of the findings is being prepared for submission to the 1933 Legislature.


SAN FRANCISCO & VICINITY
COPYRIGHT BY RAND MCNALLY & COMPANY
SCALE OF MILES
To Santa Rosa and Redwood Empire
To Vallejo
To Sacramento via Carquinez Bridge
San Rafael
Richmond
CUTTING BLVD.
San Pablo
El Cerrito
Albany
Berkeley
University of California
Mill Valley
Sausalito
Tiburon
Belvedere
ANGEL ISLAND
GOLDEN GATE
Piedmont
OAKLAND
Alameda
Oakland Airport
San Leandro
Hayward
South San Francisco
Daly City
SAN FRANCISCO
BAY
OCEAN
PACIFIC
Burlingame
San Mateo
Millbrae
San Andreas Lake
Pilarcitos Lake
Crystal Springs Lake
Bonifacio
Alameda
Moraga
Lafayette
Orinda
Walnut Creek
Pinole
Hercules
Richmond
Mare Island
Vallejo
Benicia
Martinez
Concord
Pleasant Hill
Walnut Creek
Danville
San Ramon
Livermore
Pleasanton
Dublin
Hayward
San Lorenzo
Alameda
Oakland
Berkeley
Albany
El Cerrito
San Pablo
Richmond
Mill Valley
Sausalito
San Rafael
Tiburon
Belvedere
Piedmont
Emeryville
Oakland Airport
San Leandro
San Francisco Bay Toll Bridge
To Stockton, Tracy and San Joaquin Valley
To Modesto and Stockton
To Santa Cruz
To San Jose and Los Gatos

1933

Oct 1934

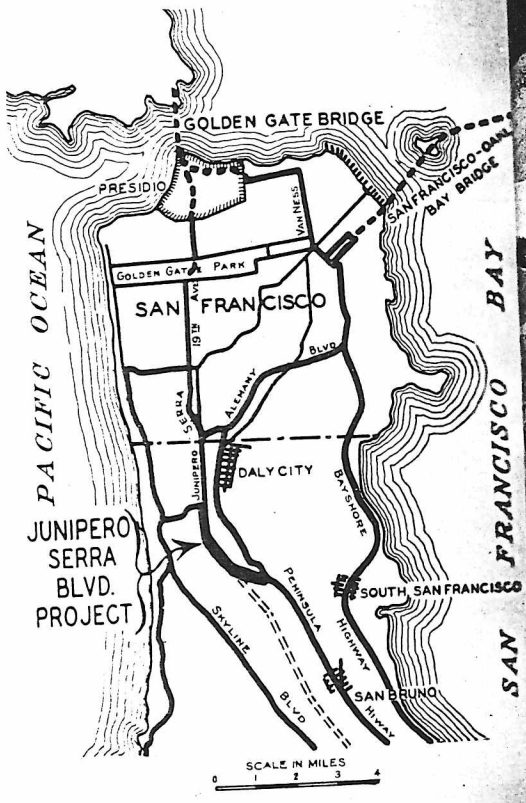
State Completes New "Feeder-Road" Link of Junipero Serra Boulevar

By JNO. H. SKEGGS, District Engineer

JUNIPERO SERRA BOULEVARD is an arterial serving a large and rapidly growing traffic between San Francisco and points south, especially in San Mateo County. Traffic census for the boulevard taken in January, March and July of this year shows average counts of 10,129, with peak counts as high as 18,256 vehicles per day.

Junipero Serra Boulevard is the natural development resulting from the need of a common outlet for traffic converging in "the circle" which is made by a major intersection of West Portal Avenue, St. Francis Boulevard, Sloat Boulevard and Portola Drive.

From "the circle" southward to the county line the boulevard is part of the system of city streets. Near the county line Alemany Boulevard, another city arterial of high standard design, joins Junipero Serra. About one-half mile north of the Alemany intersection Junipero Serra is joined by the Nineteenth Avenue Extension, likewise of high standard construction as far north as the intersection with Sloat Boulevard.



FEEDER ROAD LINK

From the county line southward Junipero Serra Boulevard is under jurisdiction of Joint Highway District No. 10 and stands in the relation of a "feeder" road to the State highways.

This great highway is in process of stage construction and now reaches southward more than two miles beyond Daly City, the last extension being a link 1.97 miles in length constructed by the State Division of Highways.

Outstanding features of Junipero Serra Boulevard are that it originates in the westerly borders of San Francisco's residential district and is in the natural line of a traffic outlet for a vast section of the city population. Likewise it is the natural routing for through traffic between the Redwood Highway of north bay counties and the highways of the peninsula of the bay via the Golden Gate Bridge.

As feeders to the boulevard are extended northerly, especially the major extension to reach the Golden Gate Bridge via Nineteenth and Funston avenues, traffic will be greatly increased.

TRAFFIC HAS INCREASED

Numerous other tributary streets feed th arterial, and central city areas contribu large volumes of passenger traffic via su important connections as Portola Drive ar Alemany Boulevard, which, by reason recent improvements, has nearly doubled traffic.

For several years past this traffic has h no alternative but the connection to Route (El Camino Real) via School Street in Da City, thereby being forced to combat a da gerous railroad crossing, two right ang turns and the congestion of business distric

Junipero Serra Boulevard throughout has right of way 125 feet or more in width. P location and general setting are most fav able to continuance of a minimum numb of intersections, and to the preservation conditions essential to an arterial highwa

(Continued one page 16)

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ra Boulevar

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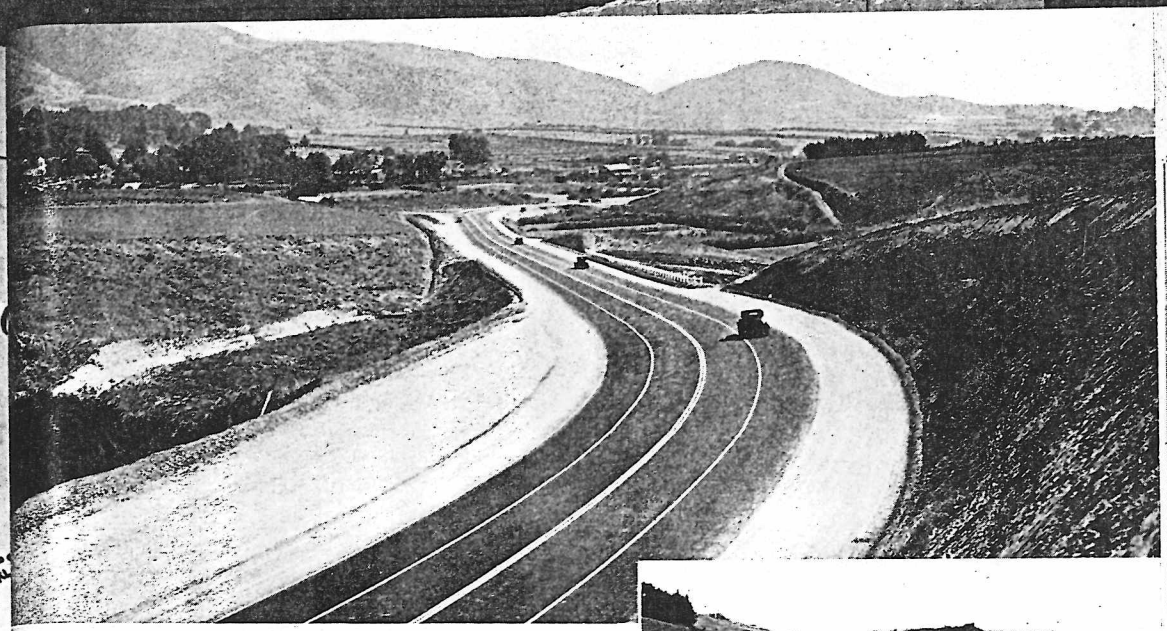
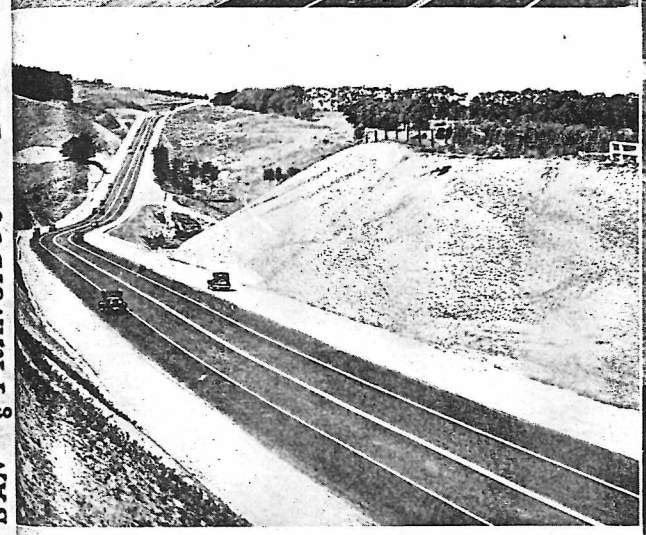
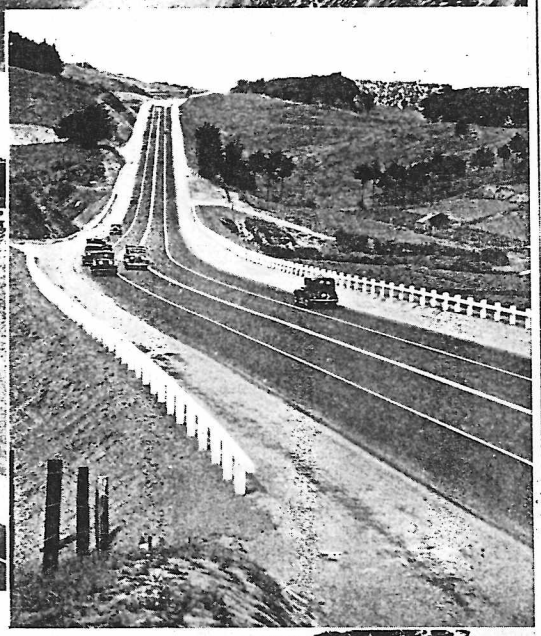
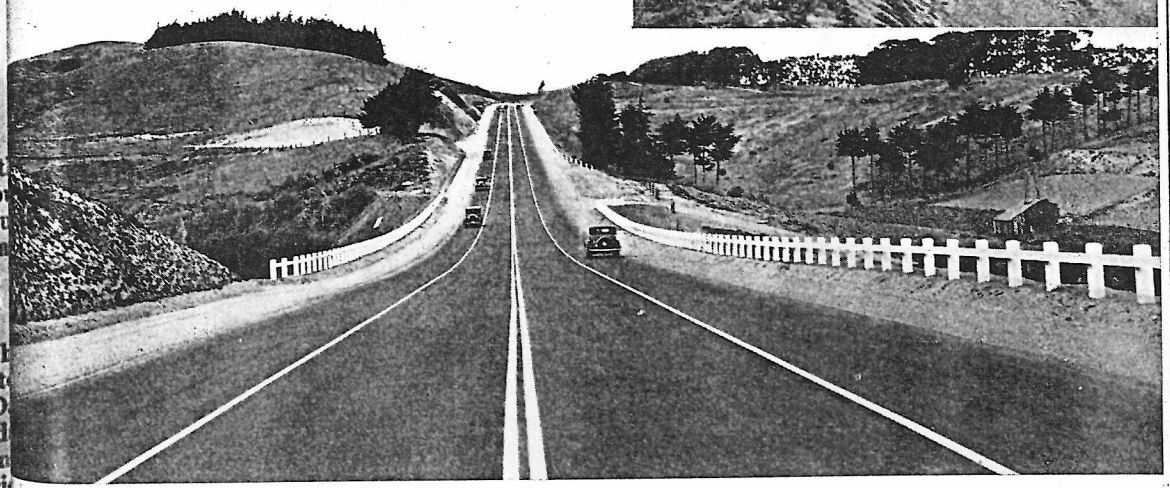








ATEST MODERN STANDARDS of highway construction are incorporated in the recently com-
extension of Junipero Serra Boulevard, one of San Francisco's main arterials down the Peninsula.
ew unit, 1.67 miles long, is graded to a width of 65 feet including a small berm on hills. The 40-
avement is 6-inch asphalt concrete on 4-inch crusher run base. The shoulders of 4-inch crusher run
have an oil bound surface and shoulder treatment is extended to adjacent gutters. Maximum
is 5 per cent. Double striping marks the center of the four traffic lanes.

Traffic Able to Avoid City Congestion

(Continued from page 2)

Tentative plans for extending the boulevard southward are ready when joint highway district funds for further construction become available.

STATE BUILDS EXTENSION

During the past summer the work of extending Junipero Serra Boulevard southward from junction with School Street in Daly City to Edgemar Road (a distance of 0.63 mile) was completed by Joint Highway District No. 10 at a cost of about $9,600, which cost included a concrete structure separating Washington Street from the boulevard.

At the same time the State has been constructing the "feeder" road extension southward from Edgemar Road, including a connecting link eastward to join El Camino Real (State Highway Route 2, U. S. Highway 101). This unit is a total of 1.97 miles in length, of which 1.6 miles is the boulevard and 0.37 mile is the connection to Route 2. The connection, however, is of the same high type construction as in the boulevard itself, and the finished project is one outstanding in attractiveness and serviceability.

TRAFFIC AVOIDS CONGESTION

Traffic is now able to avoid all conditions of city congestion and delay all the way from Sloat Boulevard and Portola Drive to the open road of Route 2 and its connections to the bay shore.

Construction of the section described in this article was commenced early in the spring of this year and completed in September. Location is all in open country over a terrain of low hills. Excavation, however, was wholly in soil consisting of sand tightly bound with an ideal admixture of clay, so that the resulting roadbed is compact and stable.

Curvature is light and 5 per cent grade is the maximum. The roadway was graded to a width of 65 feet, including side ditches and a small berm on hills.

Pavement consists of 6 inches of crusher run base 40 feet wide surfaced to the same width with asphalt concrete 6 inches thick.

The shoulders have a surfacing of crusher run base compacted to a thickness of 4 inches constructed as an oil bound surface by applying emulsified asphalt in three coats, three-quarters gallon per square yard total. The shoulder treatment is extended to cover adjacent gutters.

Cut slopes are uniformly 1:1 and rounded at the top.

In keeping with our policy of roadside beautification, and as a measure to prevent wind erosion of the cut slopes, the cut faces have been beautified with plant growth. Ice plant was used for the purpose and with complete success. Cost of the protection was about $0.05 per square yard of surface planted. This treatment results in beautifying as well as protecting the slopes.

BUILT WITH FEDERAL FUNDS

Roadway excavation amounted to about 280,000 cubic yards, all of which was required to build the embankments. The work was done with heavy crawler type tractors and wheeled scrapers of 12 cubic yards capacity. Average haul was about 1000 feet.

The contractor's price for earthwork was $0.13 per cubic yard, a remarkably low figure for the present high standard requirements in earthwork.

Total construction cost, including engineering, for this new section of the boulevard was less than $208,000 and the project was financed entirely from Federal government funds.

The heavy volume of traffic now using this connection to the city is sufficient testimonial to the fitness of the improvement.

PROJECTS UNDER WAY ON MORRO-FRESNO SECONDARY

Between Atascadero and Morro in San Luis Obispo County, from 6 miles east of Morro to the Atascadero Summit, a distance of about 3.2 miles, the road is being constructed with a 20-foot selected material surface on a 28-foot graded roadbed.

This project comes under the provisions of the NIRA. Plans are complete for the construction of a portion of this road within the limits of the Santa Barbara National Forest, a distance of about 4 miles.

These projects are a portion of the route between Morro Bay and Fresno, which was included in the secondary roads taken over from the county by the act of the Legislature.

Friend: "Why have you given the general such a peculiar pose?"

Sculptor: "You see, it was started as an equestrian statue and then the committee found they couldn't afford the horse."—*Brantford Expositor.*

July 1935

Two Important Federal Aid Routes in San Francisco Widened by State

By JNO. H. SKEGGS, District Engineer, District IV

THE completion of the Bay Shore Highway by the State Division of Highways from the south city boundary of San Francisco to the Santa Clara-Alviso road, near Santa Clara and San Jose, and the completion within the City and County of San Francisco of the Bay Shore Highway from the south city boundary to Army street, created heavy traffic congestion on Potrero avenue and Tenth street as arteries between the business area of San Francisco and the Peninsula points.

The former street widths of these two links were such as to congest traffic during a great portion of the daylight hours, especially peak hours and the late afternoon and early evening.

With federal funds available to finance the work out of an allotment of $600,000 to be spent within the City and County of San Francisco the roadway to Potrero avenue was widened through the setting back of curbs to provide a uniform width of 72 feet between newly constructed curbs.

TRACKAGE RECONSTRUCTED

The Municipal Railway tracks in Potrero avenue were formerly the Ocean Shore Railroad trackage and were on 15 foot centers. To provide the two traffic lanes and a parking lane on each side of the car tracks it was necessary for the Municipal Railroad to reconstruct the trackage, reducing the centers between the tracks.

The major work on Potrero avenue consisted therefore of setting back curbs; replacing sidewalks; widening the existing pavement with portland cement concrete and resurfacing the existing pavement with asphalt concrete.

The widening and resurfacing of Potrero avenue, the most important link from the Bay Shore Highway to the business district, still left the arterial incomplete to the Civic Center; therefore the work of widening Tenth street from Potrero avenue to Market street, Van Ness and the Civic Center, was also undertaken and the work consisted of setting back curbs, constructing a portland cement concrete parking strip and resurfacing the old pavement with asphalt concrete.

ARTERIALS TO BRIDGE

The Market Street Railway had previously removed their trackage on Tenth street, leaving the newly constructed street an unobstructed arterial solely for highway traffic.

It is now possible to traverse newly constructed and reconstructed highways from Market street, San Francisco, directly into San Mateo and Santa Clara counties via the Bay Shore Highway.

Basically these two highways have been included in the highway system primarily to serve as arterials leading directly to approaches to the San Francisco-Oakland Bay Bridge. Bryant street and Harrison street from Tenth to Fifth street are also included under the same appropriation for widening and resurfacing as units which will lead traffic directly to the bridge entrance in Fifth street.

WIDENED TO 72 FEET

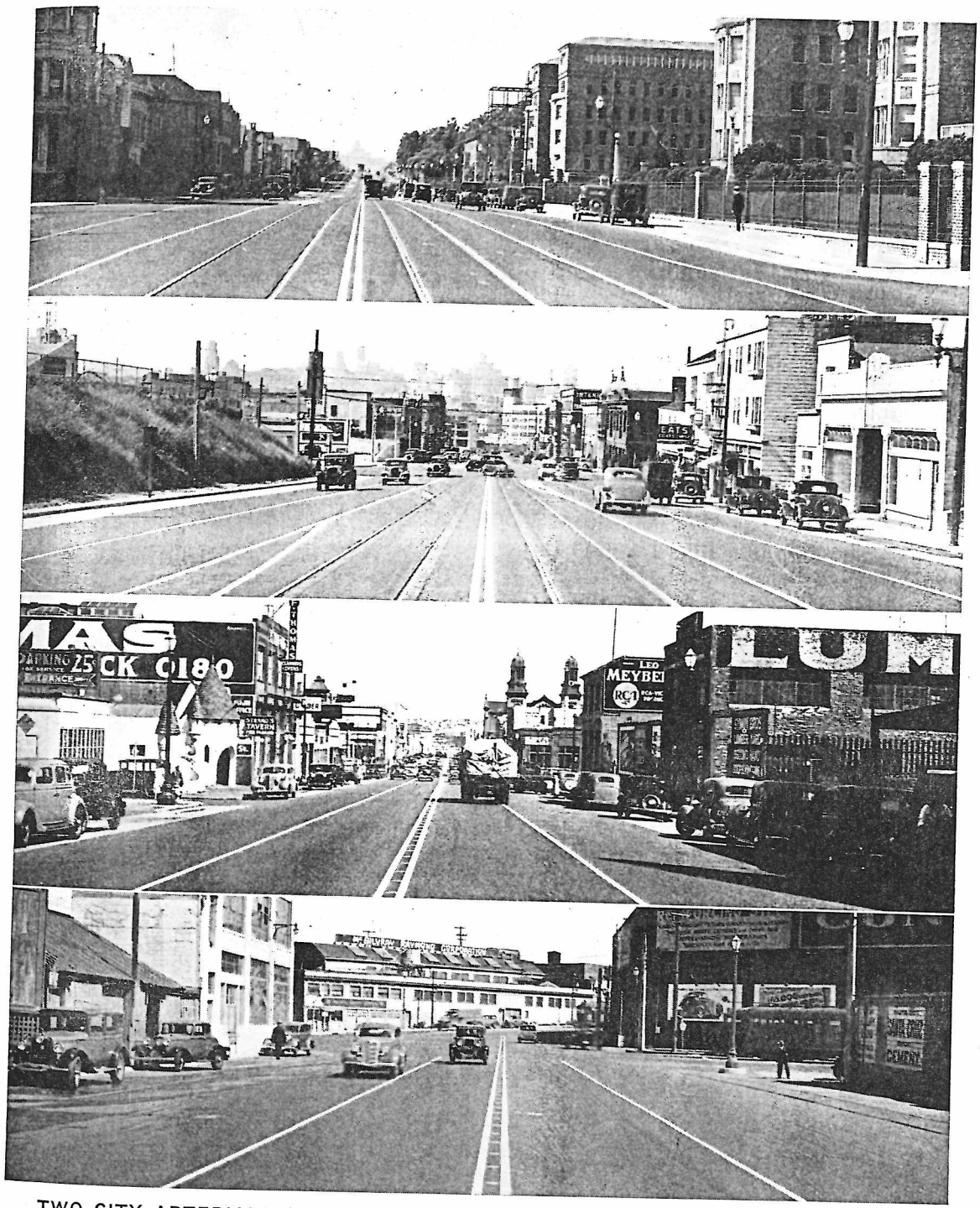
In April, 1934, a contract was awarded for widening Potrero avenue, from Division street to Army street, 0.85 mile, by placing portland cement concrete pavement strips seven feet wide and 0.6 foot thick on each side of the existing roadway, and resurfacing the remainder of pavement with asphalt concrete. Existing tracks of the Municipal Railroad being on 15-foot centers (wider than standard practice) required reducing to Municipal Railroad normal centers of approximately 11 feet.

A net distance between curbs of 72 feet was obtained, which, after allowing for parking on new concrete widening strip, leaves room for two lanes of travel on each side of railway area.

Major contract items included 1274 cubic yards of roadway excavation, 28,454 square yards of asphalt concrete surface and 4442 cubic yards of portland cement concrete removed; 4646 cubic yards of portland cement concrete pavement placed; 2133 tons of crusher run and 3142 cubic yards of ballast placed; 10,719 tons of asphalt concrete laid, and 11,817 lineal feet of granite curbs reset with 327 lineal feet of new curb placed.

Moving of trolley poles, span and feed

(Continued on page 11)



TWO CITY ARTERIALS on Federal Aid routing through San Francisco—Potrero Avenue and Tenth Street—have been rebuilt to modern traffic standards to serve as thoroughfares leading to the approaches of the San Francisco-Oakland Bay Bridge. Potrero Avenue has been widened and resurfaced to 72 feet between curbs, to provide two traffic lanes and a parking lane on each side of the car tracks. Extending the improvement to the Civic Center, Tenth Street was also widened and resurfaced. The two upper pictures show portions of the Potrero Avenue improvement looking northward from Twenty-fourth Street past the County Hospital and northward from Seventeenth Street. The improved Tenth Street, looking south from Market Street and another section looking into Potrero Avenue, are shown in the two bottom pictures.

Two Federal Aid Arterials Widened in San Francisco

(Continued from page 4)

wires and risers, and new and adjusted manholes, catch basins and many other minor items were included in the contract.

The contract was carried on at the same time that a number of other city and private contracts were under way on the street, these contracts covering placing of tracks, new high and low pressure water mains, a gas line and power and telephone lines.

Total cost of the contract was $145,352.

Fell street, from Van Ness avenue to Market street, and Tenth street, from Market street to Division street, a total of 0.9 mile, were widened five feet on each side, with portland cement concrete, and the remainder of the roadway resurfaced with asphalt concrete. Net widths of 48 feet 9 inches and 60 feet respectively were obtained.

Contract for this portion was let in May, 1934. Major contract items included 5146 tons of crusher run base, 5728 tons of asphalt concrete, 1184 cubic yards of portland cement concrete pavement, 7346 lineal feet of granite curbs being reset, and 616 feet of new curb placed. The approximate cost was $71,000.

These two projects, as completed, are splendid examples of wide highways in cities; and, with the comprehensive system of traffic stripes and markers as placed (a broad, double stripe in the center), safely and easily guide traffic to the south of Market business area, with the terminus adjacent to the Civic Center, allowing of diffusion of traffic to north of Market business area and the various residence districts.

The construction of these two projects completes the Bay Shore Highway system connection to San Francisco, and the projects now under way, namely, Bryant and Harrison streets, Fifth street to Tenth street, Fifth street from Bryant street to Harrison street, and the San Francisco approach, Fifth street to the San Francisco-Oakland Bay Bridge, will provide broad and easy connection to the bridge and East Bay cities.

Don't feel flattered when people call you a good egg. A good egg is the kind you can use.

"My wife has been nursing a grouch all the week."
"Been laid up, have you?"—*Christian Science Monitor.*

QUIT YOUR GROUCHIN'

BY FRANK M. COLVILLE

Assistant Editor, Right of Way

Cut out the grumblin' an' cussin',
An give your old jaw bones a rest,
Maybe the fellow you're naggin'
Is doin' his dead level best;
And you hain't a goin' to help him
By proddin', or askin' him why
He wasn't workin' lots faster?
Just 'cause you're standin' near by.

There's danger in too much complainin'
And sometimes things go all to smash,
Just' cause the big guy, that's a bossin',
Gets up in the air and acts rash;
For the fellow that's doin' the diggin'
Likes a boost, or occasional smile,
And better results will sure follow
If you jolly him once in a while.

There's nothin' to gain by fault-findin',
An' sometimes it sure comes to pass,
That you'll find some conspicuous blunders
If you look at yourself in the glass.
If you try to be pleasant an' human,
Folks are apt to be decent to you;
If you're kindly, an' white, an' obligin',
You'll find others honest and true.

So cut out the rough stuff, quit ballin',
Get your face limbered up for a smile,
Spill out great gobs of contentment,
Go light on the wormwood an' bile;
Don't act like a savage, or cave-man,
In his sort of half-civilized day.
It costs to be ugly and grouchy,
It pays to be cheerful an' gay.

District Engineer Wallace Wins Praise

District Engineer E. E. Wallace, of District XI, Division of Highways, with headquarters in San Diego, has won the commendation of State Highway Engineer C. H. Purcell for his "initiative and success in securing the passage of parallel parking ordinances in towns on the Coast Highway (State Route No. 2) between the Orange County line and the city limits of San Diego."

Anticipating a greatly increased traffic over the highways in his district, on account of the San Diego Exposition, Mr. Wallace sought the cooperation of the City Council of Oceanside and the San Diego County supervisors and succeeded in having parallel parking established in all towns, both incorporated and unincorporated, on over 70 miles of the heavily traveled Coast Route.

The original knee-action vehicle was the bicycle.

November 1935

State Completes Alemany Link With San Francisco's Boulevard System

By JNO. H. SKEGGS, District Engineer

THE San Francisco Peninsula has long been a problem as far as highway development is concerned.

Bounded on the west, north and east by the Pacific Ocean and San Francisco Bay, the only outlet for the motor vehicle traffic of the city of San Francisco except via ferries or toll bridge is to the south.

The city of San Francisco has been developing an extensive boulevard system in the city, and also has contributed to the development of several highways outside of the city.

The state has taken a number of city streets into the state highway system, and has recently supervised the expenditure of about one-half a million dollars of federal apportionment funds in improving some of the major streets forming connections and feeders to the two bridges now under construction across San Francisco Bay.

LATERAL HIGHWAY NEEDED

In order to allow for segregation of traffic between the major highways leading to the south, it is necessary to construct laterals.

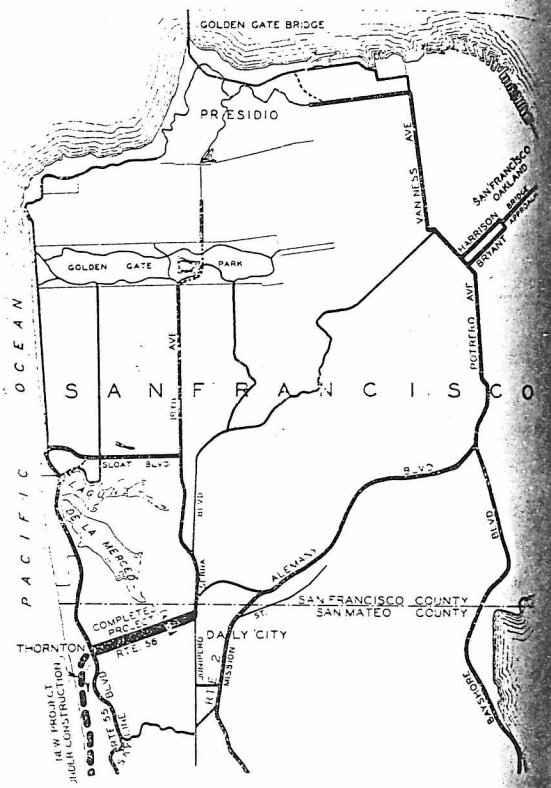
For this purpose the city has constructed the Alemany Boulevard from the Bay Shore Highway to the Junipero Serra Boulevard, just north of the south city limits.

In order to allow completion of this lateral to connect with the Skyline Boulevard, the state has constructed the section from the westerly end of the Alemany Boulevard near Daly City, westerly to the Skyline Boulevard at Thornton, 1.7 miles, all in San Mateo County. This now becomes State Route No. 56 in lieu of the section of the old Edgemar Road from San Pedro Avenue (and Edgemar Road) to junction with the Skyline Boulevard.

The project, financed from federal apportionment of Federal Emergency Relief funds for 1935, was let to contract in March, 1935.

The work consisted of constructing a graded roadbed 56 feet wide and placing a bituminous treated, crushed gravel or stone surfacing 42 feet wide and 0.25 foot thick, on a crusher run base 0.50 foot thick.

The major contract items were 244,000 cubic yards of roadway excavation, with about 2,000,000 station yards of overhaul. Crusher run base was placed in the amount of about 16,750 tons, with 6000 tons of treated surface.



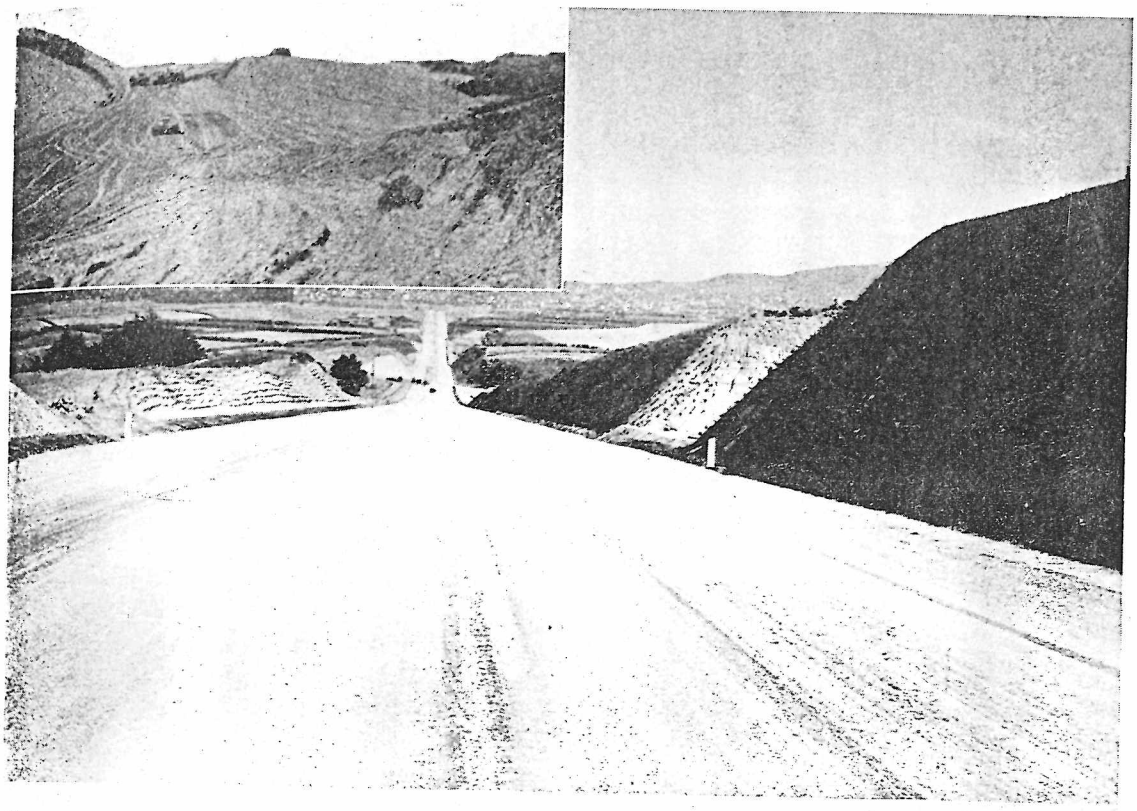
MAP of completed project shown by heavy black line.

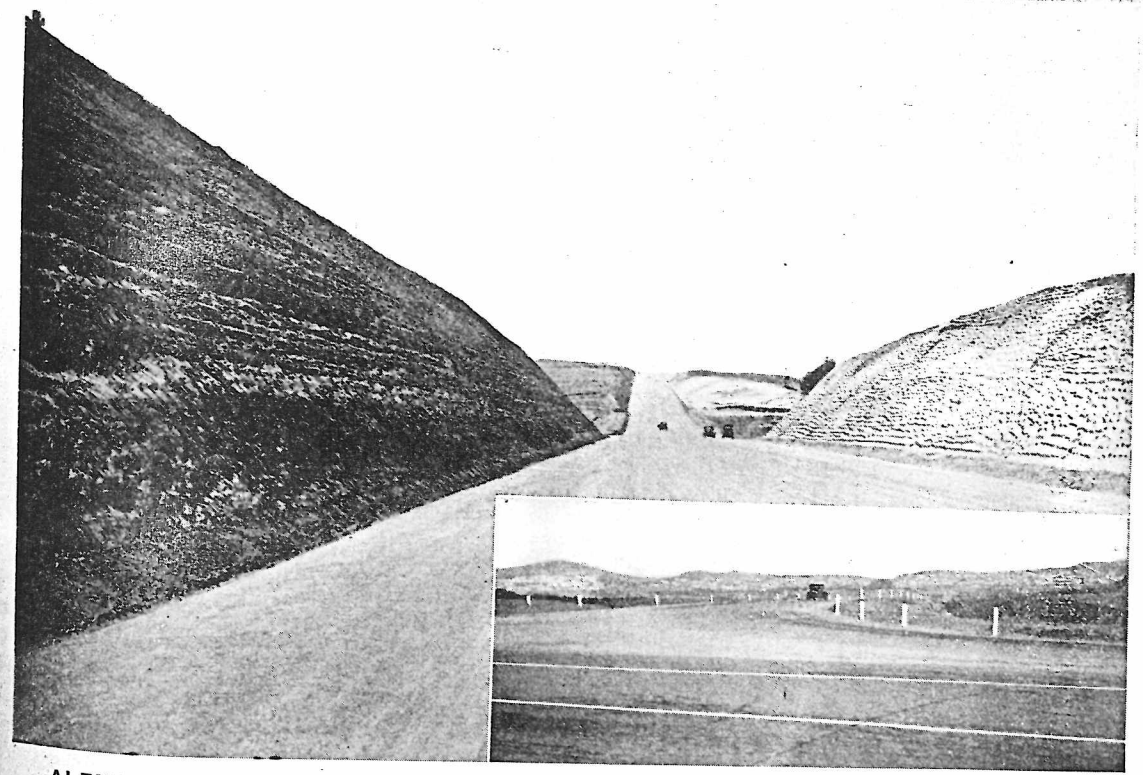
Several deep gulches required 30 inch and 72 inch culverts, and adjacent to the Junipero Serra Boulevard, it was necessary to move a 54 inch and a 30 inch water main belonging to the San Francisco Municipal Water Department.

The water mains, being the principal source of water from the Calaveras and Hetch-Hetchy water sheds, speed in changing, and extreme care were required not to interfere seriously with the cities' water supply.

The excavated material involved in the project was chiefly sand, and while a large

(Continued on page 22)





ALEMANY BOULEVARD EXTENSION just completed by the State in San Mateo County connecting Skyline Boulevard and Junipero Serra Highway required 244,000 cubic yards of roadway excavation with 2,000,000 station yards of overhaul. The new highway is 1.7 miles in length and slopes are extensively planted. Upper inset shows part of grading operation. Lower inset shows Skyline intersection.

Conejo Grade Will Have Third Lane to Permit Passing

(Continued from page 14)

In general a 20-foot concrete pavement will be constructed on a 46-foot roadbed although on the grade down the westerly slope of the range two 10-foot strips of concrete pavement will be separated by a 10-foot width of plant-mixed oil surfacing. This will provide a 10-foot traffic lane between the concrete strips for vehicles to pass on the grade.

On some of the high fills, oil and rock surfacing will be used instead of concrete pavement until the fills have had time to attain their full settlement. Shoulders throughout the length of the project will be oiled the full width of roadbed, thus providing ample space for vehicles to park well off of the paved area.

Preliminary estimates indicate that 770,000 cubic yards of excavation and 5,300,000 station yards of overhaul will be required for the grading of the project and 6660 cubic yards of concrete pavement will be placed.

Approximately one year is being allowed in which to complete the contract so that by the latter part of 1936 it is expected the new road will be opened to traffic.

At the westerly end of the project the present bridge across Conejo Creek is to be widened under separate contract to a width of 44 feet to conform to the width of roadbed on each side.

NEWMAN-CROWS LANDING REALIGNMENT ABOLISHES BAD TURNS

(Continued from page 16)

the 5th District, have shown a fine spirit of cooperation by building the right of way fences on the entire project, as well as extending a timber cattle pass beneath the railroad to connect with one built under the new highway.

The dedication ceremonies were held on the new highway midway between Crows Landing and Newman. Among the speakers on the program were President Arthur Rathaus of the Newman Chamber of Commerce; President C. R. Perrier of the West Side United Chambers of Commerce; E. K. Finney, chairman, Board of Supervisors; J. F. Blakely and F. C. Tatton of California State Chamber of Commerce.

5000 Cu. Yds. Per Day Moved by Tractors or Alemany Proje

(Continued from page 20)

amount of material was involved, the w was performed with exceptional speed a ease, as shown by the fact that it was po ble to move 5000 cubic yards per day, us three 80 h.p. tractors with three 12 cu yard carryalls, and operating three 6-h shifts per day.

The alignment is exceptionally good, be one tangent with sweeping curve connecti to the boulevards at either end of the proj Grades are light, and a connection is r being made to the Merced Boulevard n the center of the project.

TRAFFIC GREATLY INCREASED

The resulting highway is a splendid s ple of this type of temporary road as de oped to allow cheap construction pending fi settlement of fills, etc., together with a s iceable roadway for fast and heavy traffic

As soon as it was possible to travel road, the motoring public did so, and date the traffic has increased so fast tha is estimated that there are 1000 machin day using it. This will be greatly augmer when the adjacent section to the south f Thornton to Edgemar, now under contr is completed.

The total cost of the project is appr mately $135,000.

33 CURVES ELIMINATED ON COA HIGHWAY ROUTE

(Continued from page 12)

brane of Grade E asphalt to prevent mois or water percolating upwards into the sele material subbase.

At Nojoqui Creek a 14 x 16 foot reinfo concrete arch culvert was constructed. feature of this structure was the adoptio a heavily reinforced concrete arch inve order to adequately support the struc which was situated over soils incapabl supporting the load imposed by using the tomary footings for such structures.

The project was advertised for compet bids and awarded to the lowest bidder.

The cost aggregated a total expenditu about $425,000.

Apr 1936

Geodetic Survey Reveals Difference in Coast Sea Levels

(Continued from page 23)

placed not only for the use of government organizations but for the use of federal, state, county, city and private organizations and individuals, it is not unreasonable to assume that those organizations will be glad to assist in the preservation of the marks.

In any case where it becomes necessary to move a bench mark or a triangulation station and a field party of this bureau is at work in the locality, this party will make the necessary transfers. If no Coast and Geodetic Survey party should be working in the locality, the bureau tries to enlist the cooperation of the local authorities.

DESIRABLE PROCEDURE

When it becomes necessary to move a bench mark or a triangulation station, the desirable procedure is to inform the Director of the Coast and Geodetic Survey at Washington, D. C., by letter, concerning the necessity for relocating the mark and giving the designation, that is, the letters and numbers found stamped on the bronze tablet with dies and enough of the legend cast in the disk to enable this office to determine definitely the organization by which it was established.

In case the mark is one over which this bureau has jurisdiction, a new disk properly stamped is forwarded together with instructions as to the proper procedure in transferring the elevation, position, or both, as the case demands. With the help of engineers and surveyors, the percentage of casualties resulting from engineering construction will be very greatly reduced.

All elevations of bench marks in the control net are referred to the datum of mean sea level. A theoretical study made of the combined level nets of the United States and Canada, carried out in 1929, indicated that the mean sea level surface as defined by tidal observations at many stations on the Pacific, Atlantic and Gulf Coasts is somewhat warped and that the average elevation of mean sea level of the Pacific Coast is about 1.7 feet higher than the average elevation of mean sea level on the Atlantic and Gulf Coasts.

MEAN LEVEL FIXED

While this may appear to be quite a large difference, the country is also large and therefore it was possible to hold fixed as a zero elevation the plane of mean sea level at each of the principal tidal stations for purposes of adjustment. The distortion of the net caused by holding at zero the observed tidal planes of mean sea level at the principal stations usually did not do violence to any single line of levels. The rate of correction resulting from this procedure was so small that it is not noticeable in local engineering surveys and has no troublesome effect on extensive topographic mapping.

About 1400 more miles of lines will be needed to complete the 25-mile spacing called for by the present plan. However, there may be a few areas in the high mountains where the ideal spacing may not be realized for some itme to come but such areas are relatively unimportant and comparatively few in number.

As rapidly as possible after the field observations have been made, computations and adjustments are carried on in the Washington Office of the Coast and Geodetic Survey and the descriptions and elevations of the bench marks are published first in mimeographed form and later are printed in book form.

Owing to the sudden closing of the field and office work some months ago, when the emergency funds allotted to the Survey became exhausted, much computation and adjusting of field observations on triangulation and leveling remain to be done to obtain final positions and elevations.

South San Francisco Underpass Widened and Opened to Public

THE NEWLY widened South San Francisco underpass on the Bay Shore Highway was opened to highway traffic on March 12 with a colorful ceremony participated in by the local high school band, State Highway Commissioner Timothy A. Reardon and State Senator Harry L. Parkman.

When the old structure, giving a roadway width of thirty-nine feet, was completed in 1926, it was built with full provision for the widening that was foreseen, although perhaps the increase in traffic has been more rapid than anticipated.

The necessary curved alignment made the negotiation of the old bottleneck a hazardous undertaking. It was accordingly decided in 1934 to provide another full thirty-nine feet of driving surface with a center pier between the new and old roadways. But upon noticing that motorists had a tendency to veer away from the side walls, it was determined not to attempt to call for four lane traffic. Instead, stripes have been painted on the roadway providing a total of six wide lanes of about thirteen feet each, with one-way traffic on each group of three lanes.

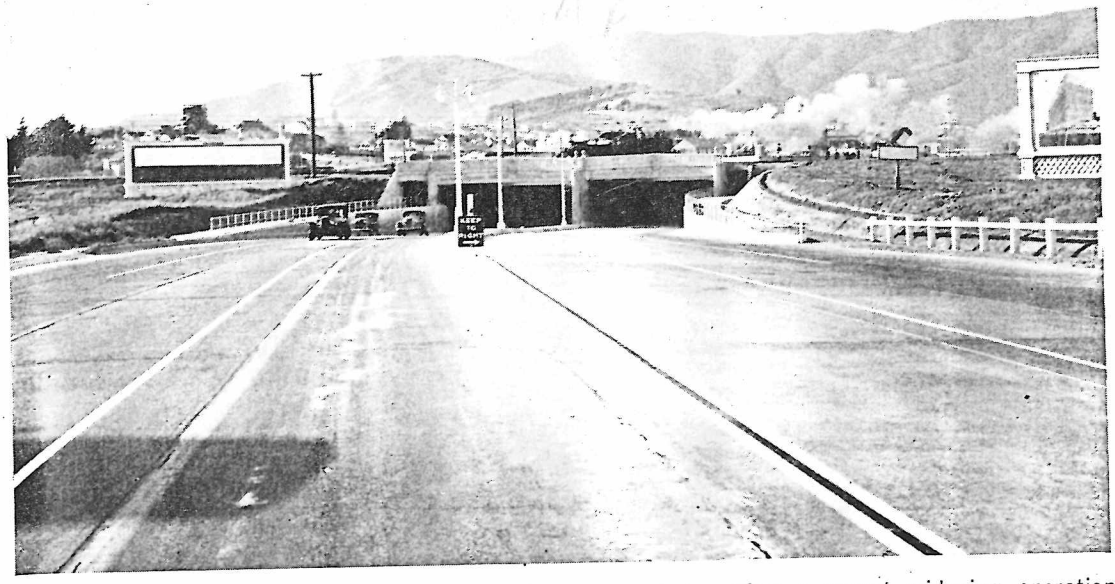
LARGE PUMPS INSTALLED

The total cost including the provision of a superstructure carrying the tracks of the Southern Pacific Railroad was $203,000.

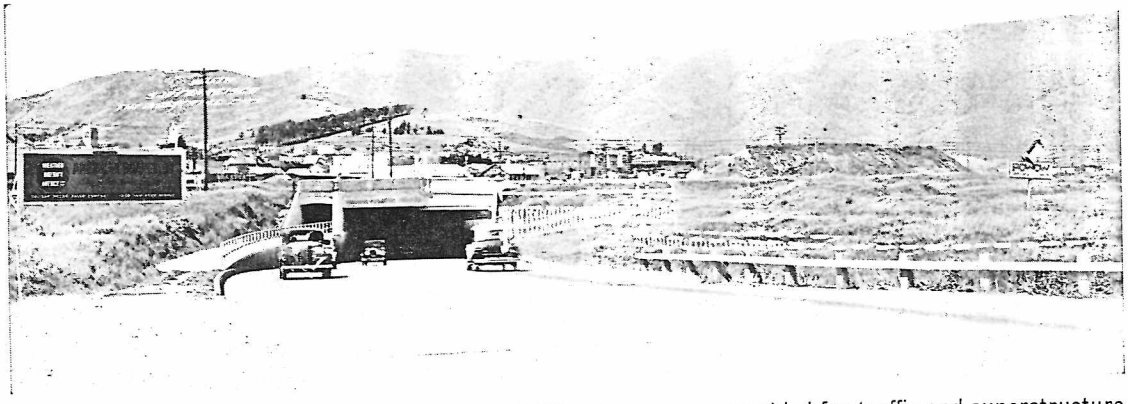
At the lowest part of the subway it was necessary to provide a pavement two feet six inches thick to resist the hydrostatic head of about eight feet. Adjacent pavement was secured against uplift by concrete dowels let into the rock foundation.

Pumps of large capacity were installed in a new pump house, so that a flood of any reasonable intensity can now be cared for adequately, and a complete system of lights has been supplied for pedestrian tunnels and roadway. In addition street lights have been placed on electroliers in the center curb at entrances, so that any hazard from faulty lighting has been removed.

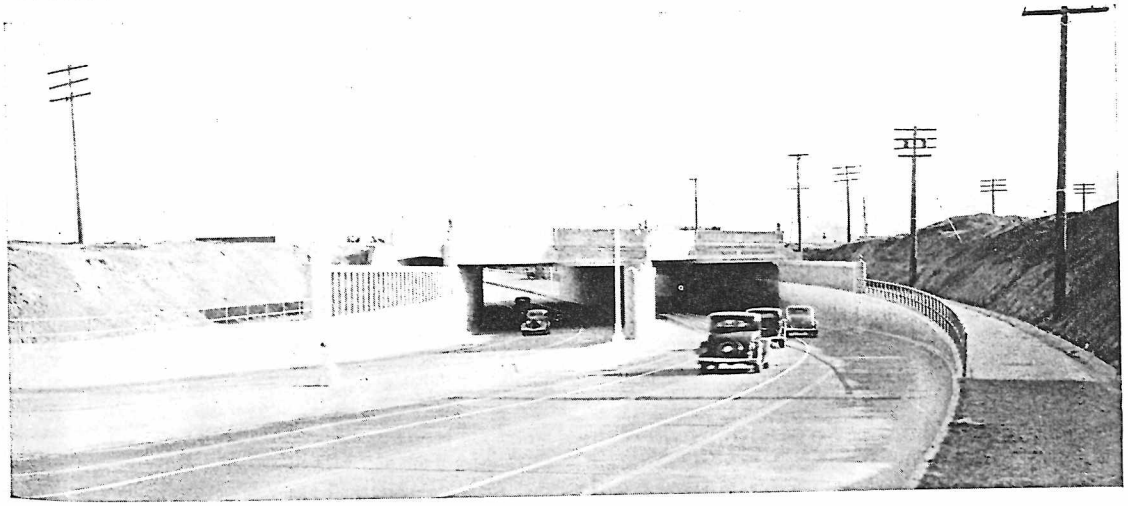
This center curb is a unique safety feature. Recognizing the danger of any center support in an underpass of this sort, thought was given to methods of preventing the unwary motorist from wrecking his car on the center wall, with the result that a center curb four feet six inches wide was built up for nearly three hundred feet on either side of the structure. At the start of this curb, a specially illuminated sign warns motorists: "Keep to the Right." From here the curb is gradually increased to one foot in height, and surmounted by half a dozen 8-inch posts set in concrete and three electroliers.



SOUTH SAN FRANCISCO UNDERPASS as it appears today after a recent widening operation.



BEFORE WIDENING—Dotted lines show how additional space was provided for traffic and superstructure.



WIDENED TRAFFIC LANES separated by a curbing are shown in view of north side of underpass.

JULY 1936

A REPORT ON

THE SAN FRANCISCO CITY-WIDE TRAFFIC SURVEY

W.P.A. PROJECT 6103-5363

PREPARED FOR

WILLIAM H. WORDEN, DIRECTOR
DEPARTMENT OF PUBLIC WORKS

BY

MILLER McCLINTOCK
TRAFFIC CONSULTANT

SAN FRANCISCO
1937

CHAPTER X

A LIMITED WAY PLAN FOR SAN FRANCISCO

In dealing with the present and future problem of traffic accidents and traffic congestion in a great metropolis such as San Francisco it is no longer profitable to deal solely with superficial aspects of the problem nor with superficial relief measures. Relief measures through education, enforcement, regulation and certain types of minor physical improvements are recommended elsewhere in this report. Many of these relief activities are of prime importance at the present time and many will be necessary in some form for all time. What is required however, is not a continuing series of relief measures, but a permanent cure for the major problem of accidents and congestion. This cure is outlined herewith.

Basic Causes of Traffic Accidents and Traffic Congestion

All traffic accidents and all traffic congestion arise from identical types of causes in traffic movement. These causes may be listed and described as follows:

(1) *Medial Friction:* This is the interference, potential or actual, which takes place between two lines of traffic moving in opposite directions in the same roadway. It is the cause of many traffic tangles and blockades and is the primary cause of head-on collisions and the secondary cause of most "side-swiping" accidents.

(2) *Marginal Friction:* This is the interference, potential or actual, which takes place between a line or lines of moving traffic and standing vehicles, persons or obstructions in or near the margin of the roadway. It is acutely manifested and illustrated by the hazardous and congestive "eddies" in traffic in the presence of double line parking, though there is an almost infinite series of conditions resulting in similar disturbances.

(3) *Intersectional Friction:* This is the interference, potential or actual, which takes place between two or more lines of traffic intersecting on the same plane. It is a primary cause of vehicle - vehicle, and vehicle - pedestrian collisions, and is the major cause of traffic congestion in San Francisco as well as in all other great cities. When this interference becomes actual and acute, it is the normal practice to install traffic control signals, which

despite their necessity, reduce the full gross capacity of the intersecting routes to less than 50% of their free flowing capacity. Potential interference is even more important as a congestive factor, for considerations of caution require the normal safe driver to operate through almost every intersection as though the interference were actual.

(4) *Internal Stream Friction:* This is the interference which takes place between the units in a traffic stream moving in the same roadway in the same direction. It results primarily from differentials in velocity. It is the major cause of rear end collisions and a principal congestive influence. It arises from the operation in the same stream, of vehicles with different operating characteristics, typically illustrated by street cars, trucks and passenger cars, and from a cross-section design of the roadway precluding adequate segregation of vehicles with different operating potentials or of vehicles engaged in different types of traffic activities.

A comprehensive examination of traffic accident and traffic congestion in the City and County of San Francisco confirms the examinations made elsewhere and leads to a basic conclusion, to-wit: that all traffic accidents and all traffic congestion arise from these and from no other primary causes and conversely that traffic accidents and traffic congestion can be reduced only to the degree that these causes are removed or mitigated.

Elements in Limited Way Design

To accomplish these objectives it is necessary to project a type of roadway design which physically precludes the occurrence of the four types of "friction" described above or so reduces their seriousness as to render them unimportant. Such a type of route may be designated as a "Limited Way," that is a roadway placing limitation upon the basic causes of accidents and congestion.

It is described as follows: A "Limited Way" is a roadway for the exclusive use of motor vehicles (and as the term is used herein, for the exclusive use of motor vehicles of the private passenger car type or of other passenger or commercial vehicles of similar weight and operating characteristics) which has the following physical elements:

(1) A complete and continuous physical separation of opposed streams of traffic;

(2) No direct access to abutting property and with all entries and exits to and from the structure by specially designed connections;

(3) A continuous separation of all intersections with no cross movement of any kind across the operating lanes of the Limited Way;

(4) A cross-section design to permit an adequate segregation of relatively fast and relatively slow vehicles and with retarding lanes at exits and accelerating lanes at entries.

Methods of Achieving Limited Way Design

With the essential elements of Limited Way design described it is apparent that the objectives cannot be obtained by any method of control or by any minor physical adjustment in normal street design. Thus attention must be turned to new types of construction. Lest these types be considered as radical innovations it should be noted that each is successfully illustrated in principle in the San Francisco Bay area. A complete Limited Way type of roadway, with the unfortunate absence of a medial divider, is illustrated in the San Francisco-Oakland Bay Bridge. Similarly Limited Way type of construction with a medial divider but without adequate provision for entires and exits is illustrated in the new East Shore Highway leading northward from the above bridge to Richmond. Such innovation as may be involved in Limited Way construction lies in the complete and consistent application of the four basic elements to continuous and coordinated route construction.

Limited objectives can be obtained through any one of three types of treatment:

(1) *An elevated Limited Way* which provides for a continuous elevation of the major route over all intersecting routes. For preliminary functional designs see Figure 235.

(2) *A depressed Limited Way* which provides for the carrying of the major route below the grade of all intersecting routes. See Figure 237.

(3) *A Limited Way treatment* of an existing grade route to achieve a portion of the Limited Way objectives. See Figure 238.

Each of these three types of construction has been used in the proposed plan according to character of area, topography or other considerations. Notes with respect to typical connectors between Limited Ways and between a Limited Way and a ground route are contained in Figures 238-239. The inclusion in this Figure of a reference to potential bus stations and passenger loading platforms requires explanation. The Limited Way structures and the Limited Way plan proposed herein would appear to be properly adapted to use by high-speed, light, express buses. The operating capacity of the structures proposed is adequate to absorb a considerable volume of such traffic without undue interference with the normal load. Figure 239 indicates one manner in which bus

loading facilities may be incorporated, though special and more elaborate facilities may be provided where needed. No recommendation is made with respect to the incorporation of bus traffic, as mass transportation is a subject beyond the scope of this report except insofar as it affects vehicular and pedestrian traffic movements.

Principles Governing Design of a Limited Way Plan

The design of a comprehensive Limited Way plan for the City and County of San Francisco carries heavy responsibilities, not alone because of the relatively large cost ultimately involved but because of the great benefits which will accrue if the system is accurately adjusted to the present and future needs of the community. This responsibility is assumed with confidence because of the adequacy of the Survey materials now available.

These materials divide themselves into several natural classifications, each of which exerts a controlling influence upon planning decisions. They are as follows:

(1) *Existing traffic volumes* to be accommodated with due regard to future increments and distribution which in the absence of unpredictable major community shifts will probably follow the present pattern with internal traffic volumes being a function of population growth in the Bay area. See Chapter III.

(2) *Facility of Movement:* this being an analysis of existing congestive factors affecting current facility of movement within the community, all of which will probably become more restrictive in the future with increased traffic volume and none of which can be materially relieved by more elaborate control methods or by street widenings. See Chapter IV.

(3) *Origin and Destination Requirements* as illustrated by present exchange of traffic volumes between functional areas within and without the city and with due regard to the special problems created by the bridges. See Chapter V.

(4) *Accident Distribution* as shown by the current location of traffic accidents within the community. See Chapter VII.

The above data is comprehensively analyzed and illustrated in the Chapters indicated, supporting the conclusions with respect to remedial measures and more especially the conclusions with respect to the Limited Way plan.

In addition to the above data two general but basic engineering principles have guided planning decisions. They may be expressed as follows:

(1) The solution of the traffic problem requires a limitation upon a continued wide dispersion of traffic seeking maximum operating speed upon a multiplicity of partially improved routes, and an increased concentration of traffic volume upon routes capable of providing relatively high speed with maximum safety.

(2) There is a basic need for an increased segregation of general large volume passenger car traffic from truck traffic, rail traffic and pedestrian traffic.

There is no lack of assurance that the general system of Limited Ways proposed herein is properly suited to the needs of the community as a whole——all of its parts——and all of its principal external connections, and it is believed that each individual route proposed is best adapted to perform its part in the coordinated city-wide system. On the other hand this report, even in its final form, cannot purport to present an exact and definitive analysis of all design and routing factors involved. Thus the routings proposed herein should be considered as suggestive and functional in character.

A LIMITED WAY PLAN FOR THE CITY AND COUNTY OF SAN FRANCISCO

In the light of the above considerations and descriptions there is proposed herewith a series of projects all of which together form a comprehensive Limited Way plan for the City and County of San Francisco and all of which are illustrated in Figure 241.

DESCRIPTION OF LIMITED WAY PROJECTS

Bayshore - Potrero - Division - Twelfth:

South of the City-County line it is recommended that the Bayshore Highway be given limited way treatment at grade. Beginning at a point just south of the City-County line and continuing northerly to a point just south of Tunnel Avenue the route should be elevated. Thence northerly to Wheat Street give limited way treatment at grade with a grade separation at Third Street. From Wheat Street to a point between Bacon and Burrows Streets elevate. From that point to just south of Silver Avenue give limited way treatment at grade. The route should thence be depressed to a point just north of Augusta Street. From this point the route should be elevated to a connection with the Market - Van Ness Rotor along the line as described. Easement

will be required in the line of Twelfth Street projected to Division Street. Connecting ramps should be provided at Alemany Boulevard, Army Street, Twenty-Second Street, Seventeenth Street, Brannan Street, and at the Market - Van Ness Rotor.

Harrison Street and Tenth Street Connector:

From a junction with the South Van Ness Avenue elevated route at approximately Fifteenth Street, on a line along Harrison Street projected and in easement to be acquired, this route should be elevated and thence in Harrison Street to a point just east of the truck ramp of the Bay Bridge. Thence easterly in Harrison Street there should be Limited Way treatment at grade to a point just east of Beale Street, thence elevated to a connection with the elevated route in the Embarcadero. In Tenth Street an elevated route should be built connecting the Harrison Street elevated route with the elevated route in Potrero Avenue at Division Street. Ramp connections should be provided for the Harrison Street elevated route at Seventh Street, at Fifth Street and the Bay Bridge distribution structure, and at Third Street. An elevated rotor connection should be provided to the Limited Way in Third Street. A branch of the First Street off ramp of the Bay Bridge should be given east and west connections with the Harrison Street structure. Similarly east and west connections should be provided from the Harrison Street route to the Fremont Street on ramp of the Bay Bridge.

Market Street - Portola Drive:

From the Market - Van Ness Rotor this route should be elevated to a point over the easterly portal of the Twin Peaks Tunnel with ramp connections at Valencia Street, Duboce Avenue, and Seventeenth Street. Thence to Junipero Serra Boulevard this route should follow the Market Street - Portola Drive alignment with Limited Way treatment at grade and with as much easing of grade and curvature as may be possible. This latter recommendation is conditioned upon availability of the Twin Peaks Tunnel for joint bus and passenger car operation, in which case West Portal Avenue should be elevated, and the Portola Drive route will be preserved as a scenic route.[1]

[1]This report makes no recommendations with respect to the possible use of the existing Twin Peaks Tunnel as this involves traction and transportation policies beyond the scope of this Survey. Certain facts respecting present and possible future use of this structure are, however,

Junipero Serra Boulevard:

A large diameter rotor should be constructed at the junction of Junipero Serra Boulevard, Sloat Boulevard and Portola Drive, with street car loading facilities in the central island, if rail service is continued, and with pedestrian tunnels to adjacent sidewalks. From this rotor southerly to the junction with Nineteenth Avenue Extension this route should be given Limited Way treatment at grade.

Sloat Boulevard:

From the rotor at Junipero Serra Boulevard westerly to its connection with the Great Highway - Skyline Boulevard, this route should be given Limited Way treatment at grade. Ramp connections should be provided at Nineteenth Avenue and the ramp connections should be completed at Sunset Boulevard. Westbound Sloat Boulevard traffic should be provided with an underpass connection to the new diagonal roadway to Skyline Boulevard. A large diameter rotor should be constructed at the junction of Sloat Boulevard, the Great Highway, and the Skyline Boulevard.

Great Highway - Skyline Boulevard:

This entire route should now be given Limited Way treatment at grade and eventually that portion from Lincoln Way northerly to a point south of the Cliff House should be depressed with pedestrian overpasses or provided with a grid overdecking.

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pertinent. The approximate public investment in the tunnel structure is $4,000,000. If interest and maintenance charges be estimated at 5% the carrying charges would be $200,000 per annum. The current average daily traffic in street car passengers is approximately 20,000 persons for the twenty-four hour day in both directions, or 7,300,000 persons per annum. The annual overhead of $200,000 distributed to the total traffic results in a carrying charge of 2.7 cents per passenger carried. There is now exchanged between the general areas served by the Twin Peaks Tunnel a daily traffic of more than 30,000 automobiles by routes much longer and with grades much less favorable than those afforded by the Tunnel. With a loading factor of 1.5 this traffic represents a daily automobile passenger movement of 45,000 persons or an annual automobile passenger movement of 16,425,000 persons. Combined with the annual street car traffic of 7,300,000 persons this makes an annual combined traffic of 23,725,000 persons. The annual overhead of $200,000 distributed to this combined annual traffic results in a carrying charge of only .84 cents per person. With a four cent gas tax, with assumed average gas consumption at fifteen miles per gallon, with an automobile loading factor of 1.5 and with a tunnel length of 2.22 miles, automobile traffic would contribute to overhead at the rate of .40 cents per passenger. In cross-section the Twin Peaks Tunnel compares favorably with the New York Midtown Vehicular Tunnel under the Hudson River. Maximum observed street car traffic at peak hour in the Twin Peaks Tunnel is now twenty street cars per hour in one direction or a headway of three minutes. Bus substitution might double the number of mass transportation units to a maximum of 40 per hour. Even this load would leave an unused capacity for passenger car vehicular traffic in each direction of more than 1,000 movements per hour. Vehicular use of the Tunnel would of course require the installation of a ventilating and lighting system, and a substitution of pavement for the trackage.

Oak Street - Golden Gate Park:

Beginning at the Market - Van Ness Rotor this route should be elevated to the Golden Gate Park Panhandle, with ramp connections at Steiner Street, and Baker Street. From Baker Street westerly the route should be semi-depressed to the line of Funston Avenue extended, with pedestrian overpasss and with vehicle overpasses and connections at Masonic Avenue, Stanyan Street and at the principal park drives. From the line of Funston Avenue extended westerly to the Great Highway this should be given Limited Way treatment at grade with pedestrian and vehicle overpasses and connections at the principal park drives. In connection with that portion of the route which lies in Golden Gate Park it should be noted that the treatment is comparable to that followed by the Westchester Park Commission in New York in the development of parkways which have added so much to the amenities and accessibility of park areas.

Van Ness Avenue:

An elevated Limited Way is required throughout the length of Van Ness Avenue from its connection with the Market - Van Ness Rotor on the south to its junction with the Beach Street elevated way on the north. Rotor connections should be made with the California Street Limited Way in easement to be acquired. Ramp connections should be provided at Turk Street, Post Street, California Street, Lombard Street and Broadway. Through the Civic Center Area the elevated Limited Way should be given architectural treatment consistent with the monumental character of the existing structures in order that it may blend with these structures as the Limited Way around the Grand Central Terminal in New York City blends with that structure.

Market Street - California Street - Clement Street:

From the Embarcadero elevated route Market Street should be elevated to California Street with a ramp connection to Market and Drumm Streets. Thence elevation should continue westerly in California Street to a point just west of Stockton Street with an elevated rotor junction with the Limited Way in Kearny Street with easement to be acquired. From this point westerly the route should be depressed to a point just west of Leavenworth Street. Assuming that the cable car operation is not

SAN FRANCISCO TRAFFIC SURVEY

W.P.A. PROJECT 6108 ~ 5863

DEPRESSED LIMITED WAY

Prepared For

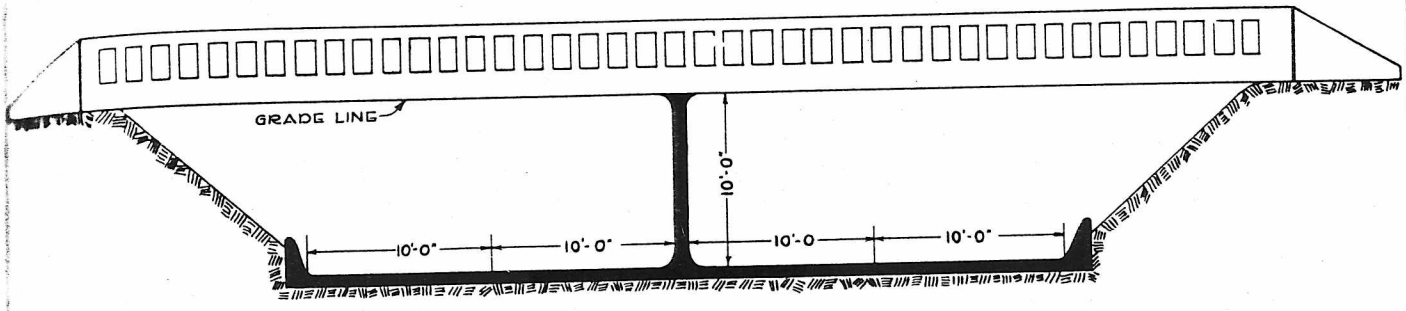
DEPARTMENT OF PUBLIC WORKS
WILLIAM H. WORDEN ~ DIRECTOR

By

MILLER McCLINTOCK
TRAFFIC CONSULTANT

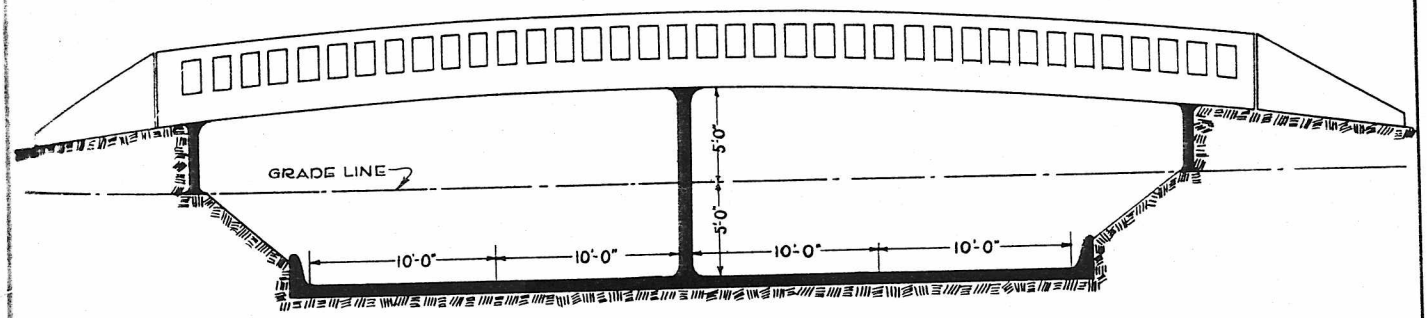
DEPRESSED LIMITED WAY

FULL DEPRESSION TO GIVE 10' CLEARANCE BETWEEN SURFACE OF LIMITED WAY AND PEDESTRIAN OR VEHICULAR OVER-PASSES. NORMAL EARTHEN BANKS.



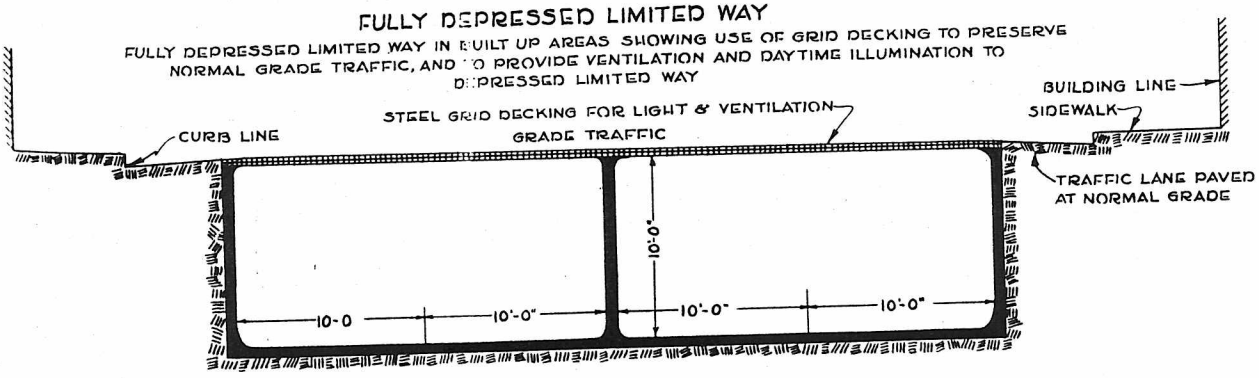
SEMI-DEPRESSED LIMITED WAY

SEMI-DEPRESSED LIMITED WAY- BALANCE OF 10' HEADWAY ACHIVED BY SUPER-ELEVATION OF PEDESTRIAN AND VEHICLE OVER-PASSES.



FULLY DEPRESSED LIMITED WAY

FULLY DEPRESSED LIMITED WAY IN BUILT UP AREAS SHOWING USE OF GRID DECKING TO PRESERVE NORMAL GRADE TRAFFIC, AND TO PROVIDE VENTILATION AND DAYTIME ILLUMINATION TO DEPRESSED LIMITED WAY



SAN FRANCISCO TRAFFIC SURVEY

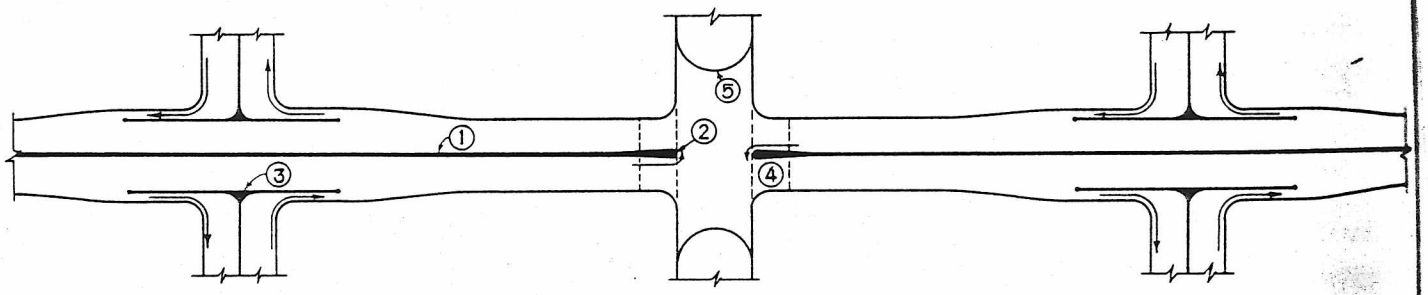
W.P.A. PROJECT 6108 ~ 5863

LIMITED WAY TREATMENT AT GRADE

Prepared For

DEPARTMENT OF PUBLIC WORKS
WILLIAM H. WORDEN ~ DIRECTOR

By
MILLER McCLINTOCK
TRAFFIC CONSULTANT



1 - MEDIAL DIVIDING STRIP
2 - TURNING ISLANDS AT BREAKS IN MEDIAL DIVIDING STRIP - ENLARGED TO GIVE PROTECTION TO TURNING VEHICLES.
3 - BARRIER TO PREVENT DIRECT ACCESS TO ROUTE BY FORCING RIGHT TURN MOVEMENTS.
4 - PEDESTRIAN CROSSWAY - AT GRADE IN FIRST STAGE DEVELOPMENT - AND BY TUNNEL OR BRIDGE WHERE LARGE VOLUMES ARE ENVOLVED.
5 - MANY MINOR RESIDENTIAL STREETS CAN BE SHUT OFF ENTIRELY - GREATLY TO THE BENEFIT OF RESIDENTS - ACCESS TO THE LIMITED WAY ROUTE BEING PROVIDED AT THE NEAREST MAJOR INTERSECTION.

NOTE -
DISTANCE FROM ENTRIES TO THE NEAREST TURNING ISLAND SHOULD NOT BE LESS THAN 100 YARDS AND AS MUCH LONGER AS MAY BE FEASIBLE.

SAN FRANCISCO TRAFFIC SURVEY

W.P.A. PROJECT 6108 ~ 5863

TYPICAL RAMP CONNECTIONS

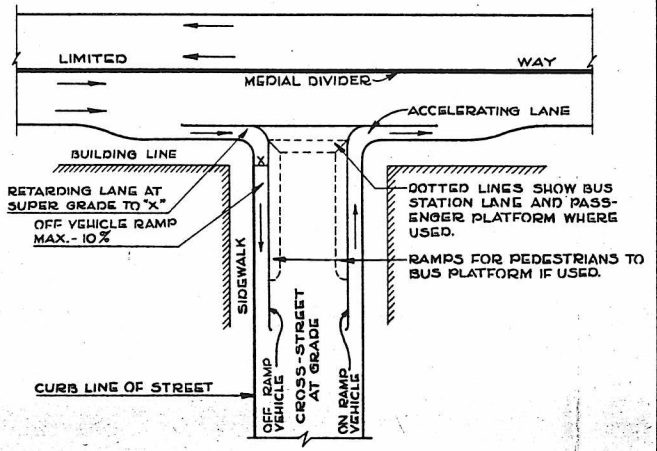
Prepared For

DEPARTMENT OF PUBLIC WORKS
WILLIAM H. WORDEN ~ DIRECTOR

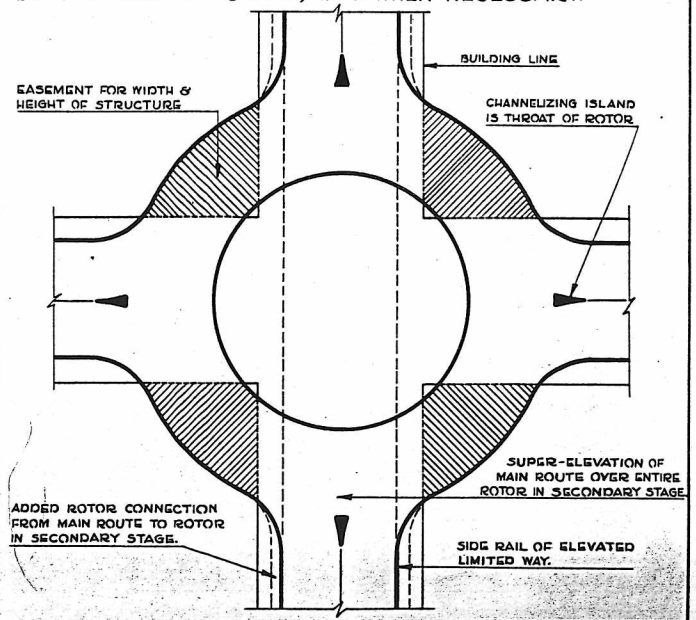
By

MILLER McCLINTOCK
TRAFFIC CONSULTANT

TYPICAL RAMP CONNECTIONS BETWEEN LIMITED WAY AND A GRADE ROUTE.



TYPICAL ROTOR DISTRIBUTOR AT INTERSECTION OF TWO ELEVATED LIMITED WAYS. SOLID LINES SHOW 1ST. STAGE; DOTTED SHOW 2ND. STAGE; IF & WHEN NECESSARY.


BUILDING LINE
EASEMENT FOR WIDTH & HEIGHT OF STRUCTURE
CHANNELIZING ISLAND IS THROAT OF ROTOR
SUPER-ELEVATION OF MAIN ROUTE OVER ENTIRE ROTOR IN SECONDARY STAGE
ADDED ROTOR CONNECTION FROM MAIN ROUTE TO ROTOR IN SECONDARY STAGE.
SIDE RAIL OF ELEVATED LIMITED WAY.

replaced by bus operation the depression should be by means of a pair of depressed ways on each side of, and immediately adjacent to, retaining walls supporting the cable car trackage. Or should sub-soil exploration and grade improvement warrant it may be found advisable to carry present rail and future grade traffic over a single open cut with grid decking. Furthermore, final consideration of costs and grades may justify deep tunnel construction for the lengths proposed for depression both for this portion of the route and for that lying between Van Ness Avenue and Webster Street. From a point just west of Leavenworth Street to a point just west of Van Ness Avenue the route should be elevated with a rotor connection with the Van Ness Avenue elevated way. This rotor connection will require easements to be secured. Thence westerly the route should be depressed, as hereinbefore described, to a point just west of Webster Street. From this point westerly the route should be elevated to a line of Thirty-Third Avenue extended, with ramp connections at Presidio Avenue, and Arguello Boulevard and with an elevated rotor connector at the Funston Avenue embanked, elevated way. A ramp connection should also be provided at Twenty-fifth Avenue. From the line of Thirty-third Avenue extended to the intersection of Thirty-fifth Avenue and Clement Street the route should be depressed with easy curvatures through Lincoln Park. From Thirty-fifth Avenue westerly the route should be given Limited Way treatment at grade to a point just east of El Camino Del Mar where the route is in Seal Rock Drive. A grade separation with ramp connections should be provided at El Camino Del Mar, and the route joined with Point Lobos Avenue, and the Great Highway route.

Berry Street - The Embarcadero - Beach Street - Marina Boulevard - Golden Gate Bridge:

From a connection with the Third Street elevated way this route should be elevated in Berry Street, and thence should be carried by elevated way along the Embarcadero to Beach Street with ramp connections at the southerly end of the Embarcadero - Harrison Street elevated way, the Market Street elevated way, with Union - Front Streets and with the Embarcadero at grade just east of Stockton Street. The route should continue at elevation westerly in Beach Street to a connection with the elevated

way in Van Ness Avenue, and with a ramp connection to the elevated way in Columbus Avenue. Thence westerly the route should be carried under Fort Mason utilizing the existing railroad tunnel widened or by new tunnel construction as may be most expedient. From the westerly portal of this tunnel located just east of Laguna Street, the route should be carried in Marina Boulevard with Limited Way treatment at grade to a connection with the existing Golden Gate Bridge Approach.

Golden Gate Bridge - Presidio Drive - Funston Avenue - Park Drives - Nineteenth Avenue - Nineteenth Avenue Extension - Junipero Serra Boulevard:

From a ramp connection with the elevated Golden Gate Bridge Approach near reservoir site this route should be elevated to a "Y" connection with a similarly elevated route extending easterly to a connection with the elevated Golden Gate Bridge Approach at a point northeasterly of the U. S. National Cemetery. From the "Y" junction above described the route should extend southerly by means of tunnel constructions beginning near the easterly end of the officers' quarters to a point northeasterly of the U. S. Marine Hospital, the exact point to be determined by a detailed engineering study. From this point the route should continue with Limited Way treatment at grade of existing roadway to Funston Avenue. Thence from a point at the southerly line of the Presidio the route should be extended southerly on an embanked Limited Way along the central drive of Funston Avenue and Funston Avenue extended to the intersection of the Limited Way in the main drive of Golden Gate Park. Obviously the tunnel in the Presidio and the Funston Avenue route should be constructed simultaneously, as fill from the tunnel can be run down grade to the Funston embankment. If this is inadequate in volume, fill can be borrowed from the semi-depressed Limited Way in the Panhandle and in Golden Gate Park. A rotor connection should be provided with the elevated Limited Way in California Street and ramp connections should be made to the Golden Gate Park Limited Way. Thence by a new Limited Way grade route a connection should be made to an elevated Limited Way beginning at a point just north of the intersection of Lincoln Way and Nineteenth Avenue. The elevated way should continue in Nineteenth Avenue to a point just south of Judah Street

with ramp connections to Lincoln Way. From this point southerly Nineteenth Avenue should be given Limited Way treatment at grade, to a point just north of Taraval Street. Ramp connections should be provided to Taraval Street and the route should be elevated southerly to a point south of Sloat Boulevard, with ramp connections to Vicente Street and Sloat Boulevard. Thence southerly the route should be given Limited Way treatment at grade in Nineteenth Avenue Extension and in Junipero Serra Boulevard with northbound movement depressed under the street railroad tracks at Eucalyptus Drive and at Worcester Avenue and with grade separation at the intersection of Alemany Boulevard.

Alemany Boulevard:

From a braided junction with Junipero Serra Boulevard it is recommended that Alemany Boulevard be given Limited Way treatment at grade with underpass and ramp connection at San Jose Avenue, to a point just southwest of Onondaga Avenue; thence this route should be depressed below Onondaga Avenue and Ocean Avenue to a point between Ocean Avenue and San Juan Avenue; thence continuing in Alemany Boulevard this route should be given Limited Way treatment at grade to its junction with the Bayshore route. Connecting ramps should be provided for the junction of Ocean Avenue and also with a new connection to Bernal Cut.

Alemany Connection, Bernal Cut, Southern Pacific R. R. Right-of-Way - Van Ness Avenue South:

A new elevated connection, in easement to be acquired, should be placed between Alemany Boulevard at Tingley Street and San Jose Avenue just west of its present overpass of Bosworth Street, thence this route should continue northwesterly through the existing Bernal Cut to Randall Street. Thence this route should be elevated and follow the line at the old Southern Pacific R. R. right-of-way widened by acquired easement to Van Ness Avenue South, thence northerly in Van Ness Avenue South by elevated way, to a junction with the Market - Van Ness Rotor. Ramp connections should be provided at Randall Street, Guerrero - Twenty-sixth Street, Van Ness Avenue South at Twenty-fourth Street, Twenty-second Street, and Seventeenth Street.

Third Street, Kearny Street, Columbus Avenue:

This route should be elevated throughout its length from its junction with Bayshore Boulevard Route at its southern end to its junction with the Beach Street elevated route on its northern end. Ramp connections should be made at Oakdale Avenue, Army Street, Mariposa Street, Townsend Street, Harrison Street, Howard Street, California Street, Broadway and Beach Street. Elevated rotor connections in easement to be acquired should be made at the junctions of the Harrison Street and the California Street elevated ways.

Market - Van Ness Rotor:

It is recommended that those routes hereinbefore described which converge on the intersection of Market Street and Van Ness Avenue be interconnected by means of an elevated rotor to be constructed in Fell Street, Franklin Street, Twelfth Street and on acquired easement as shown east of Van Ness Avenue together with other acquired easements as may be required to provide a rotor of easy turning radius. See Figure 241.

Summary of Limited Way Projects

The projects above described forming a comprehensive Limited Way Plan for the City and County of San Francisco may be summarized as follows:

Type	*Forty-Foot Divided Limited Way Structures*		
	Mileage	*Cost per Mile*	*Total*
Elevated Limited Way (H10)	33.6	$ 525,000	$17,640,000
Limited Way at Grade	26.9	32,000	860,800
Depressed Limited Way	3.3	917,000	3,000,000
Tunnel	.81	2,000,000	1,620,000
Easements and Special Connections			3,000,000
	64.61		$26,120,800

The above estimates are preliminary in character but are believed to be generous in the light of existing material and construction costs. They include adequate provision for foundations, railing, lighting, street adjustments, ramps, architectural and landscaping treatment and all necessary accessories.

Comments on Costs

Were it not for the fact that San Francisco is already provided with many of the elements of a basically sound street pattern the construction estimates as given above would be much higher. It will be noted that it has been possible to provide a Limited Way system with a total mileage of more than sixty-four miles, almost all of which may be constructed in existing right-of-way. This is due to the fact that many of the logical routes for Limited Way construction are of such width that this construction can be undertaken without the acquisition of private property. Furthermore, most of the mileage proposed lies upon routes and in areas where the character of the occupancy would not be detrimentally affected considering the character of structure proposed and the width of the existing street.

It has been possible to provide most of the benefits of true Limited Way construction by a special treatment of existing wide, grade streets. Thus 26.9 miles of the total 64-mile system are of this character of construction obtainable at an estimated cost of only $32,000 per mile which is approximately 50% of the normal cost of curb setbacks for widening purposes under current conditions.

Elevated Limited Way construction constitutes 33.6 miles of the total 64-mile system or slightly more than 50% of the total. This construction is estimated at a cost of $525,000 per mile. It should be noted that this elevated street Limited Way construction is not converted street capacity but is 100% new street capacity and the cost factors should therefore be compared not with typical street widening costs but with alternative methods of entirely new street construction through the acquisition of right-of-way, grading, paving, lighting and the provision of other accessories. The elevated Limited Way construction proposed herein does not disturb the continued use of any existing route over which it may be built. Because of this condition it may be considered as entirely new or superimposed traffic capacity.

Capacity of Limited Way Construction

In considering cost factors due attention must be paid to the relative capacities provided by widened grade routes or by newly constructed grade routes and by Limited Way construction. Exhaustive studies of relative discharge capacities of various types of roadway construction lead to the conclusion that unobstructed, free-flowing traffic

lanes such as those automatically provided by Limited Way construction, have a discharge capacity at speeds of 40 miles per hour or better of as many as fifteen hundred vehicles per hour. It is believed more conservative, however, to estimate Limited Way capacity, under normal operating conditions, at 1,200 vehicles per hour. Typical urban grade routes operated under either uncontrolled heavy traffic conditions or under traffic signal control rarely show a discharge capacity in excess of 600 vehicles per lane per hour. Thus a four lane Limited Way, that is two lanes in each direction, may be estimated as having a total discharge capacity of 4,800 vehicles per hour or a traffic carrying capacity equivalent to a newly constructed grade route with eight operating lanes.

An examination of traffic volume requirements in the City and County of San Francisco has led to the conclusion that all of the current demands, or those of the reasonably near future, can be accommodated satisfactorily upon four lane Limited Way construction. There are, indeed, certain portions of the proposed Limited Way system that could be adequately serviced so far as gross discharge capacity is concerned and at least for the present with two lane construction. This, however, is not recommended for two reasons. In the first place in a two lane divided Limited Way any vehicle failure would result in a complete blocking of one direction of flow. In the second place a four lane roadway is the minimum roadway that will provide for the normal functional requirements of traffic flow, as it is the least width of roadway that will provide for a segregation of relatively fast and relatively slow traffic moving in the same direction without an impingement upon the opposed roadway.

With respect to weight capacities the report proposes the use of the standard H10 load factor in design and construction. The use of the Limited Way system should be restricted to the vehicles of the private passenger car type or other passenger or commercial vehicles of similar weight and speed characteristics. With this class of traffic the H10 construction is more than adequate in strength. There has been no failure to give due consideration to trucking and other heavy commercial operations. This type of traffic will benefit directly and materially from Limited Way construction which will remove from main routes of travel, and related parallel streets, the principal load of present private passenger car and light commercial volume. The segregation of the light passenger car and commercial operation from trucking and heavy commercial operation is one of the fundamental steps in a complete

solution of the problem of traffic accidents and traffic congestion and both classes of traffic will instantly and materially benefit from the separated operating routes.

Anticipated Use of Limited Way System

Upon the major street system of San Francisco as it exists today and as it is graphically illustrated in Figure 55 there is daily operated in the twelve-hour day, from 7 A. M. to 7 P. M., a total of 900,000 car miles. The twenty-four hour day shows an average increase of 50% over the twelve-hour day, making a total of 1,350,000 car miles per day. This is exclusive of traffic movements in the triangle bounded by Harrison Street, the Embarcadero, California Street and Van Ness Avenue. There is no way of giving a highly accurate estimate as to what percentage of this total of car miles will be transferred to the Limited Way routes as proposed in the comprehensive Plan set forth in Figure 241. With due elimination of local traffic and heavy commercial traffic it may be safely computed that the balance of the through movements along the Limited Way routes will utilize the new structures and that the major proportions of other traffic originating within or destined to points within one-half mile of Limited Way routes will use those routes. Some proportion of this traffic at present follows existing grade routes parallel to those proposed for Limited Way construction and may be properly included in an estimate of total Limited Way utilization. This fact is clearly illustrated in customary practice in the East Bay district where substantial volumes of traffic between Oakland and Berkeley or more remote points follow a longer mileage route over the East Shore highway rather than the shorter mileage, although more time-consuming, route over existing streets. On the basis of the above considerations it may be estimated that the comprehensive Limited Way Plan as proposed for San Francisco, when constructed, will carry 670,000 car miles per twenty-four hour day or 49.6 per cent of the present total car mile movements in San Francisco. The traffic not carried will be primarily local in character, or that traffic feeding to or being distributed from the Limited Way system. All of this residual volume of traffic as well as trade and residential locations will be benefited greatly by the transfer of large volume, high speed movements, from grade routes to the Limited Way system.

The above computations are based exclusively upon a logical conversion of existing traffic from present grade route operation to the higher efficiency Limited Way operation. It does not attempt to credit

to Limited Way movements future normal increases in traffic volume throughout the community, though these will undoubtedly be substantial and will add materially to the percentage of total car mileage carried by the Limited Way system.

Attention is now directed to what may be termed "induced traffic." It has been experienced universally throughout the United States that wherever an unsatisfactory traffic facility was replaced with a higher type facility the latter converted traffic volume from the former, and in addition generated a substantial volume of entirely new traffic commonly called "induced traffic." This results from the fact that many users of motor vehicles having found the former low-type facility too inconvenient to warrant use, either did not make the trip between the points connected or used forms of transportation other than automotive.

In no place is the capacity of an improved traffic facility to induce traffic more clearly illustrated than in the case of the San Francisco-Oakland Bay Bridge. An examination of Chapter VII, "Estimate of Vehicular Traffic Available for the Bridge," in a "Report on Estimated Traffic and Earnings, San Francisco-Oakland Bay Bridge," July, 1936, by Coverdale and Colpritts, indicates that in the maximum year, 1930, the transbay ferries carried a total of 4,544,000 automobiles, though by the year 1935 the transbay automobile ferry crossings totaled only 3,937,000. If the San Francisco-Oakland Bay Bridge traffic were composed exclusively of converted ferry traffic it is apparent that it could not exceed the total of that traffic. The volume of "induced traffic" on the bridge is indicated by the fact that it is now operating at a rate of approximately 10,000,000 vehicles per annum. Of this present total 5,500,000 must be considered as entirely new or induced automobile traffic. In other words, the superior facilities provided by the bridge structure converted almost 100% of the ferry traffic into bridge traffic, and in addition, created or induced a new volume of traffic equal to more than 100% of the converted traffic. It is imposible to project a confident estimate of the amount of traffic by automobile not now existing, which would be induced by the Limited Way system. It would unquestionably be large, and in considering the relative facility provided might readily equal the "induced traffic" performance of the San Francisco-Oakland Bay Bridge. Automotive traffic has everywhere shown a startling vitality wherever obstructions to its free use have been removed. Large portions of the population in all cities have demonstrated their eagerness, and their economic ability, to provide their own private means of transporta-

tion and at their own cost wherever reasonably efficient facilities have been afforded. Naturally, any traffic volume induced by the Limited Way system would add to its relative importance as a carrier of the total car mileage of the community.

Speed Characteristics of Limited Ways

Comprehensive studies of speed and obstruction in current traffic involving more than 2,200 miles of test observations show that the average over-all speed of vehicular traffic, during off-peak hours, is at present 17.35 miles per hour. The Limited Way structures proposed herein should be designed for safe operating speeds of 60 miles per hour, with the exception of those locations, comparatively few in number, where existing physical conditions or necessary connections require a type of construction placing a limitation upon maximum speeds. It is not recommended that traffic be permitted or required to operate at the full designed speed capacity as there should be a reasonable factor of safety. It is proposed, therefore, that a fixed speed, both minimum and maximum, be set for normal operating sections at 45 miles per hour. Vehicles incapable, or drivers unwilling, to operate at this speed should not be permitted the use of the Limited Way facilities. Designated speeds of less than 45 miles per hour should be indicated for the comparatively few and short sections of the system where conditions of safety require lesser speeds. The 45 mile per hour operating speed will deliver an over-all operating average speed of 40 miles per hour which is more than a 100% increase over existing average experience. In terms of time, for the entire Limited Way system, and with an estimated daily volume of 670,000 car miles, this will result in a daily saving of 21,860 car hours, or on an annual basis in a saving of 7,978,900 car hours. There is here an interesting analogy. The San Francisco-Oakland Bay Bridge is at present operating at the rate of 10,000,000 vehicles per year with an estimated saving of 26.4 minutes per trip (See Coverdale and Colpitts, p. 49) or on an annual basis in a saving of 4,400,000 car hours. Considering the investment of $77,000,000 in the bridge structure, which motorists have so generously indicated their willingness to repay, and considering the estimated cost of a comprehensive Limited Way system at $26,000,000, economic conclusions are obvious. Over and above all of these considerations, however, must be the recognition that even the present low facility of movement over grade streets is bought at a tremendous sacrifice in safety.

Relative Safety Factors

The prime consideration in any public improvement is that of the preservation of life and limb. Important as economic considerations may be they become negligible in comparison with humanitarian considerations.

It might be possible through elaborate and costly methods of education, enforcement and control to bring some further reduction in the rate of traffic accidents and fatalities in San Francisco. It is to be doubted, however, in the light of experience in San Francisco and other American cities, if any of these remedies can materially affect the problem. Such gains as may be achieved can scarcely be other than at the cost of a further retardation in facility of movement.

As has been pointed out earlier in this chapter, accidents and congestion arise from identical causal frictions in traffic movement. Roadway design which eliminates the causes of congestion automatically eliminates the causes of accidents. An examination of Chapter VII, setting forth the present record and analysis of traffic accidents and fatalities clearly supports the conclusion that Limited Way construction would largely eliminate the present causes of accidents.

For that portion of the total major city traffic flow, or approximately 50% of the whole, there would be no pedestrian accidents or fatalities as the Limited Ways are reserved exclusively for vehicular traffic and pedestrians have no reasonable access to the structures. (This statement does not apply completely to routes given Limited Way treatment at grade, to which pedestrians will still have access, though under protected conditions.) Of the total persons annually killed in San Francisco traffic accidents 71% are pedestrians struck by vehicles.

Turning now to personal injury accidents, including fatalities, current records show 71.5% take place at intersections. As there are no intersections on any Limited Way route this great group of accidents disappears insofar as the movements of traffic upon Limited Way structures are concerned. Accident records are not maintained in San Francisco in such a manner as to make possible an exhaustive analysis of the total proportion of accidents which would be rendered physically impossible by Limited Way construction. In addition to the elimination of intersectional accidents, however, it is apparent that no head-on collisions would be possible as vehicles moving in opposite directions are physically separated. There could be no collisions with parked vehicles,

persons, or fixed obstructions along the margin of the roadway, and the only classification of acidents of which any trace of cause remains is the so-called rear end collision. This type of accident would be eliminated almost entirely because of the free flowing character of the operating lanes, the provision of retarding and accelerating lanes, the segregation of relatively fast and relatively slow vehicles, the elimination of street cars and heavy commercial vehicles from the Limited Way routes and from the resultant possibility of establishing a uniform rate of operation. These conclusions are fully verified by the almost perfect safety record of the Holland Tunnel and the elevated Westside Highway in New York City.

Architectural Design of Limited Ways

In the design of structures of high utility it is necessary also to give due consideration to the amenities of the structures themselves and to those of the areas traversed.

Tunnel construction and covered, depressed Limited Ways need no consideration as the route is out of view. Open, full or semi-depressed routes lend themselves naturally to landscaping and can be made quite as attractive as any parkway or park drive. This treatment has been illustrated for many years in the New York Westchester Park system and indeed in all parts of the country.

Embanked Limited Way construction, such as is proposed in Funston Avenue, affords a natural base for any desired form of landscaping. The general appearance of such a route and the possibilities of pleasing treatment are already illustrated in the Great Highway. The Limited Way treatment of grade routes makes possible an artistic treatment not possible in routes with wide unbroken pavements. The medial dividing strip and the turning islands may be planted or otherwise improved.

It is, however, in the design of elevated Limited Ways that the greatest need as well as the greatest opportunity is found for the application of artistic functional design and the utilization of modern forms and materials, many of which have become available only in very recent years.

It is beyond the scope of this report to present detailed structural or architectural designs. Technicians of national repute in both of these fields are generously available in San Francisco. In order, however, that there may be projected a type of design, within the functional operating

requirements of Limited Way construction and within the cost estimates, Figures 257-259 are presented. The report is indebted to Mr. Elmo Boldemann for this design. There are, of course, an infinite variety of designs providing similar pleasing appearance. In general, design should provide light, freedom from noise, cleanliness and should be based as is all modern, dynamic streamline design upon the conception of speed.

In addition to the advantages accruing through the removal of hazardous and congestive movements of through traffic, and the provision of maximum accessibility abutting property, a correctly designed elevated Limited Way should actually add to the total architectural values of the areas traversed.

Comprehensive Character of Plan

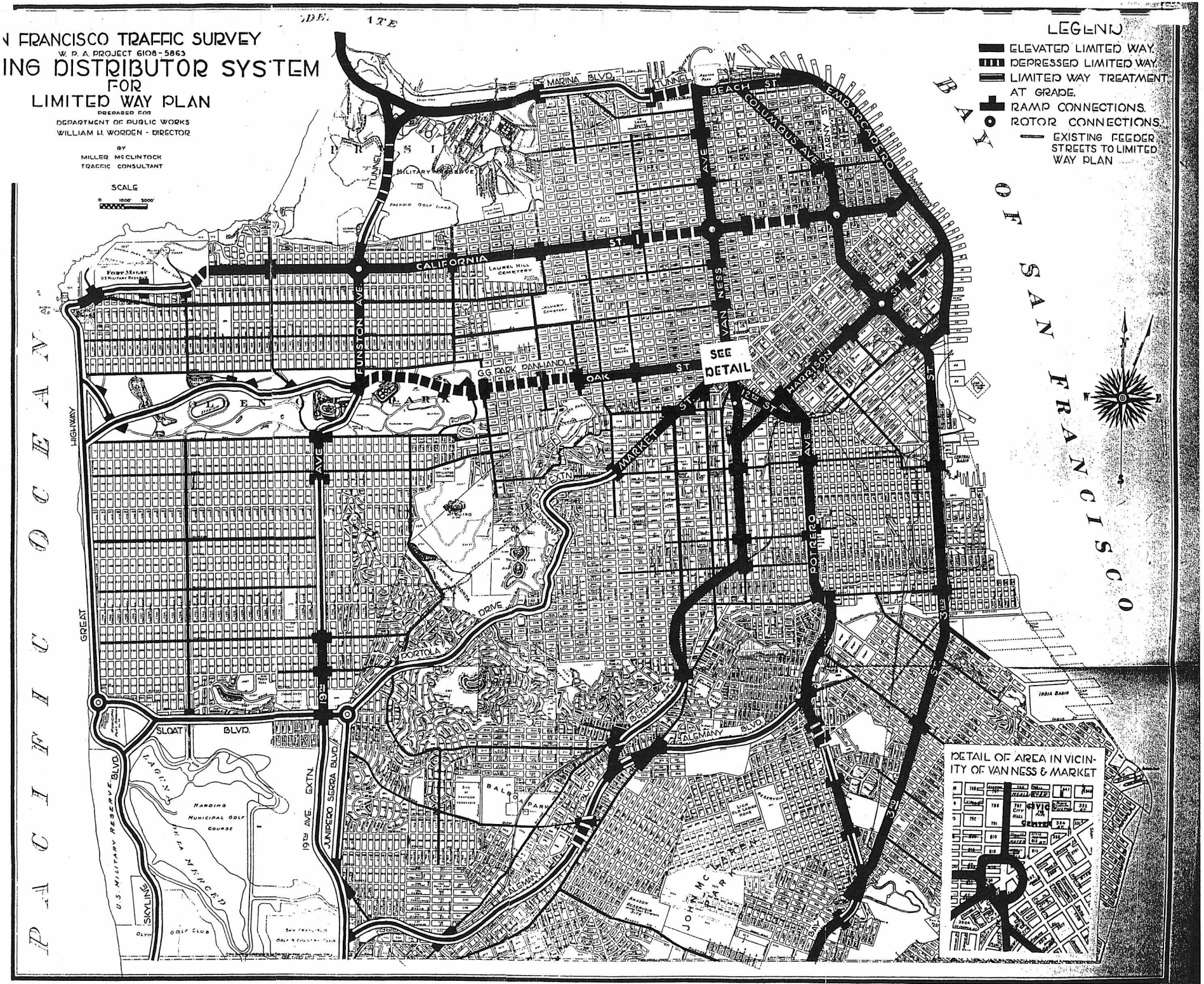
The comprehensive Limited Way Plan proposed in this report is in a true sense a city-wide plan. It is not designed for the benefit of any one part of the city but for all parts of the city and, indeed, for the benefit of the entire region. Due consideration has been given to the stabilization of values in all parts of the community and particularly to the provision of internal facilities to stabilized community values in the light of competitive attractions made potent by the two bridges.

By careful design it has been possible to project a Limited Way system providing direct connections to all of the important gateways to the city including the two bridges and a dual connection between those bridges and, in addition, to serve so comprehensively the needs of the population of San Francisco itself that there is only 16% of the territory within the incorporated limits of the City and County of San Francisco that lies more than one-half mile from a Limited Way route providing direct connections to the normal areas of destinations and no portion of the built-up territory of San Francisco, or that which may probably be built, that lies more than one mile from a Limited Way structure. It is beyond the scope of this report to examine legislative policies with respect to financing but due considerations should be given to the fact that the Plan proposed herein is not only city-wide in its benefits but regional and state-wide as well.

Related Improvement

A critical examination of the Limited Way Plan leads to the conclusion that as constructed it will largely eliminate the necessity for a

continuing plan of wide-spread and costly street opening and widenings. The major through movements of the community will be carried upon Limited Way routes and grade routes will serve primarily as local connectors or as feeders or distributors to the Limited Way system. In Figure 261 are shown existing grade routes, logically located and of adequate width to serve these primary functions. The elimination of the need for the partial improvement of a very large number of grade routes should go far toward the financing of the Limited Way Plan.


N FRANCISCO TRAFFIC SURVEY
W. P. A. PROJECT 6108-5863
ING DISTRIBUTOR SYSTEM
FOR
LIMITED WAY PLAN
PREPARED FOR
DEPARTMENT OF PUBLIC WORKS
WILLIAM H. WORDEN - DIRECTOR
BY
MILLER McCLINTOCK
TRAFFIC CONSULTANT
SCALE
LEGEND
ELEVATED LIMITED WAY.
DEPRESSED LIMITED WAY.
LIMITED WAY TREATMENT AT GRADE.
RAMP CONNECTIONS.
ROTOR CONNECTIONS.
EXISTING FEEDER STREETS TO LIMITED WAY PLAN
PACIFIC OCEAN
BAY OF SAN FRANCISCO
MARINA BLVD.
BEACH ST.
EMBARCADERO
COLUMBUS AVE.
VAN NESS AVE.
CALIFORNIA ST.
FUNSTON AVE.
GG PARK PANHANDLE
OAK ST.
SEE DETAIL
HARRISON ST.
MARKET ST.
MARKET ST. EXTN.
HIGHWAY
GREAT
DRIVE
PORTOLA
POTRERO AVE.
SLOAT BLVD.
SKYLINE BLVD.
U.S. MILITARY RESERVE
JUNIPERO SERRA BLVD.
19TH AVE EXTN.
HARDING MUNICIPAL GOLF COURSE
LAGUNA HONDA
BERNAL AVE.
ALEMANY BLVD.
INDIA BASIN
JOHN McLAREN PARK
DETAIL OF AREA IN VICINITY OF VAN NESS & MARKET

July 1937

Ribbon-cutting ceremony opening last link in Bay Shore Highway. Left to right are Timothy Reardon, State Director of Industrial Relations; H. Ray Judah of Santa Cruz, State Highway Commissioner; Earl Lee Kelly, with scissors, State Director of Public Works; Adron Beene, assemblyman, 30th district; Richard French, president San Jose City Council; Col. John H. Skeggs, district engineer; L. B. Lundborg, State Chamber of Commerce; Noa Gayle, president San Jose Chamber of Commerce; C. F. Price, resident engineer, and A. J. Raisch, contractor. Photo courtesy San Jose Evening News.

Last Link In Bay Shore Highway Dedicated

VISIONED more than thirteen years ago, the Bay Shore Highway connecting San Francisco and San Jose, heart of the rich Santa Clara Valley agricultural empire, became a complete unit of the State Highway System on June 12 with the official dedication to public service of the final 3.1 mile link from the Agnew Underpass to San Jose.

When Earl Lee Kelly, Director of the Department of Public Works, representing Governor Frank F. Merriam, snipped the ribbon stretched across the road his action signalized the completion of this $10,000,000 highway project.

The new unit connects the Agnew Underpass with the Oakland Highway near Gish Road. It is a divided highway with two 20-foot strips of concrete separated by an eight-foot section of bituminous surface.

FINEST HIGHWAY

"I consider this the finest highway in the State of California," said Col. Jno. H. Skeggs, Fourth District Highway Engineer, under whose supervision the road was built, who was one of the speakers at the dedication ceremonies. "There are no grade crossings, aside from spur tracks, except one in San Jose, which we hope to eliminate within the next year and a half. This highway link cost $230,000 to construct and is not designed as a high speed road, but a safe thoroughfare for all classes of traffic."

In a brief dedicatory talk, Director Kelly said:

"We have the finest highway system in the world, but so great has been the increase in automobile travel in California that we are ten years behind the times. The San Jose-Oakland and San Jose-Gilroy routes need new highways and we are now going ahead with plans for an east-shore highway on the Oakland side of the bay to San Jose."

OFFICIALS CUT RIBBON

With a pair of scissors, Director Kelly cut the barrier ribbon, which was held by Irene Tripp and Gladys Scott. He was assisted by Nao Gayle, president of the San Jose Chamber of Commerce, and Richard French, president of the San Jose City Council, who also wielded snippers.

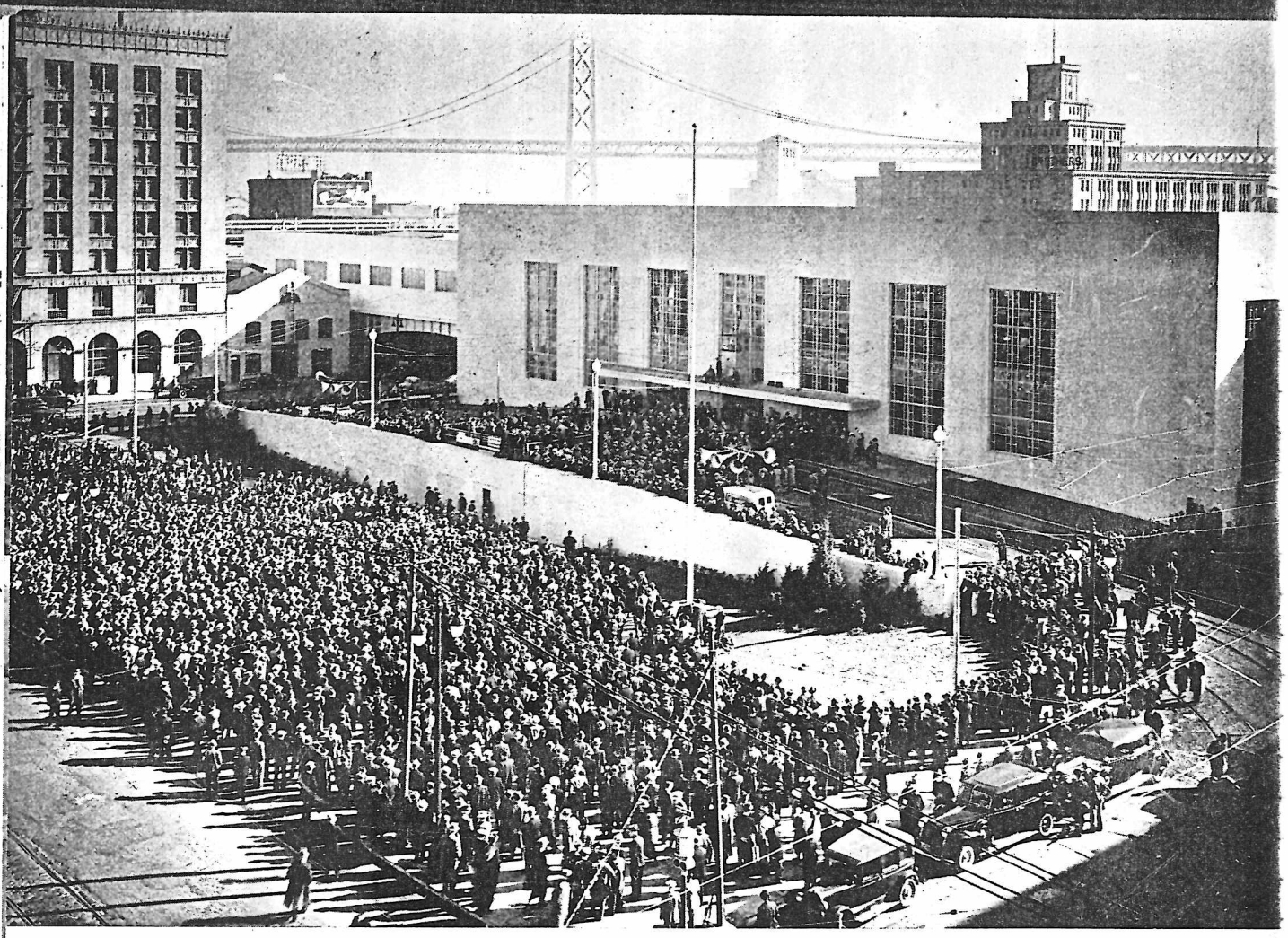
Highway Commissioner H. Ray Judah of Santa Cruz; Timothy Reardon, Director of the Department of Industrial Relations, and Col. Skeggs made brief addresses.

Short talks were made by Mr. Gayle, Assemblyman Adron A. Beene, Richard French, president of the city council; Joseph M. McKinnon, supervisor; City Manager C. B. Goodwin; George Glans, president, Merchants' Association; L. B. Lundborg, manager of the central coast district, State Chamber of Commerce; Russell Pettit, manager of the local Chamber of Commerce, and I. B. Wright, assistant secretary, highway division of the State Chamber.

The dedication ceremonies were held under the auspices of the San Jose Chamber of Commerce and the California State Chamber of Commerce and were in charge of M. R. Bookwalter, chairman of the highway committee of the San Jose Chamber of Commerce.

A gentleman was walking down the street with his little boy at his side when the youngster cried out, "Oh, Pa! There goes an editor."

"Hush, hush," said the father. "Don't make sport of the poor man. Who knows what you may come to yourself some day."



Scene at official opening and dedication of San Francisco-Oakland Bay Bridge Electric Railway Terminal Building in San Franci

Bay Bridge Terminal Dedicated

WITH a few formal words uttered at the dedication ceremonies held in San Francisco January 14, Director of Public Works Frank W. Clark turned over to Lieutenant Governor Ellis E. Patterson, representing Governor Culbert L. Olson, the State-owned Bay Bridge and State-built Bay Bridge terminal building and electric railway, the first railway ever to operate directly between Sacramento, Alameda County and San Francisco.

Director Clark said,

"Lieutenant Governor Patterson, I, as State Director of Public Works, declare the San Francisco-Oakland Bay Bridge rail facilities completed for train operation and recommend acceptance by the California Toll Bridge Authority."

Lieutenant Governor Patterson, representing Governor Olson, who is Chairman of the California Toll Bridge Authority, accepted the completed facilities for the Authority and turned the use of them over to the railroads for operation. Mr. Patterson said,

"On behalf of Governor Culbert L. Olson, Chairman of the California Toll Bridge Authority and member of the Authority, your recommendation is accepted and the California Toll Bridge Authority hereby assumes possession."

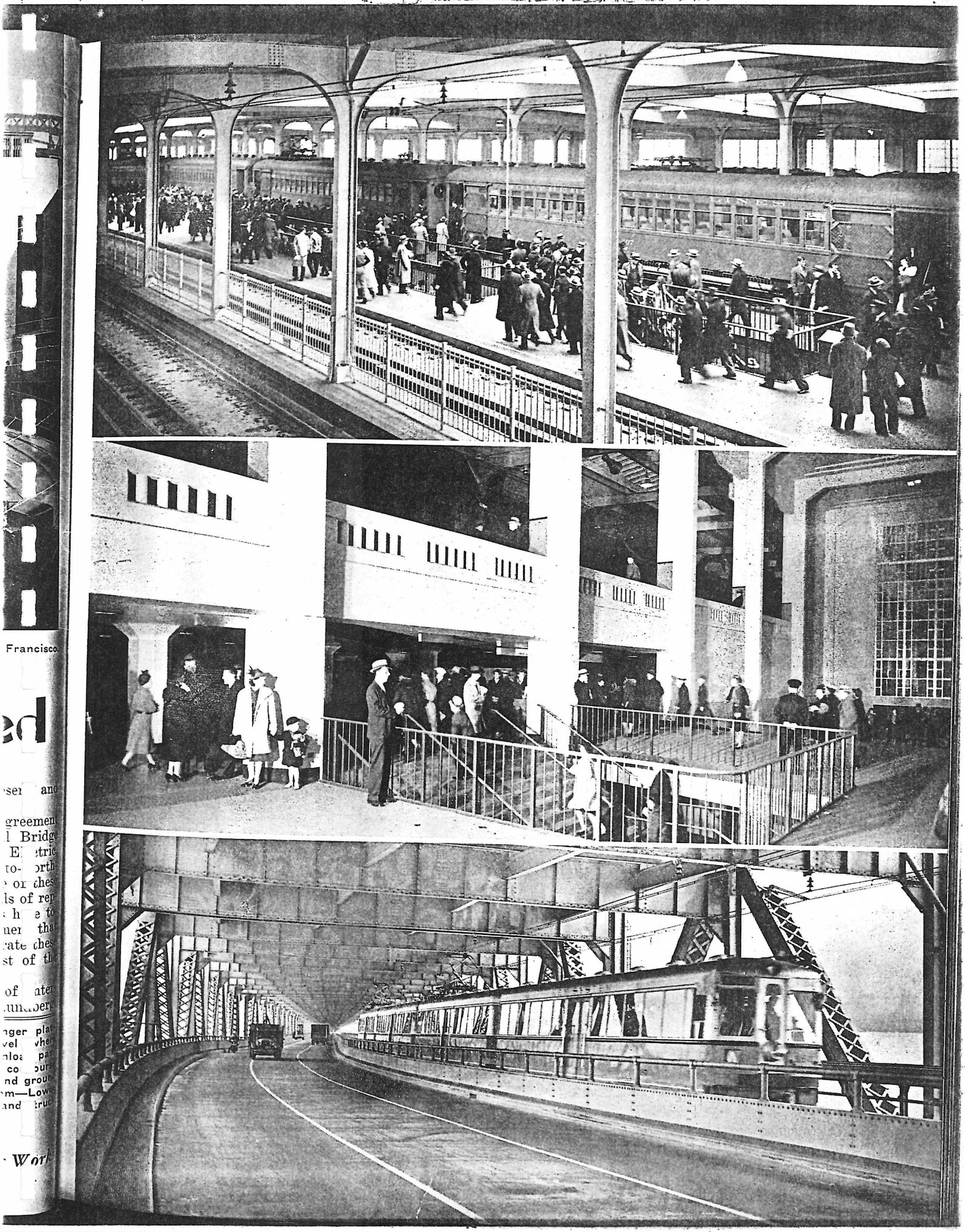
To the strains of "The Star Spangled Banner," and "I Love You, California," the National and Bear flags were then raised by the California Highway Patrol.

In completion of the formal steps necessary to the occasion Lieutenant Governor Patterson then turned to the railroad representatives present a said:

"In accordance with the agreem between the California Toll Bri Authority and Interurban Elect Key System, and Sacramento-Nor ern, I formally place the use of th railway facilities in the hands of r resentatives of the railroads here day. I am certain, gentlemen, t it will be your policy to operate th facilities to the best interest of public."

A. T. Mercier, president of Int urban Electric; Alfred J. Lundbe

At Top—One of four passenger pl forms on upper terminal level wh trains on six tracks load and unload p sengers. Center—Mezzanine concou entered from street car ramp and grou floor waiting rooms. Bottom—Lo Bridge deck carrying train and tr traffic.



president of Key System, and H. A. Mitchell, president of Sacramento-Northern, then formally accepted the use of the facilities for their companies.

The ceremonies were held in front of the newly completed terminal building facing Mission Street in San Francisco with more than 1500 dignitaries from cities of northern California, Alameda and San Francisco counties participating before a great throng of citizens who came to witness the epochal event.

The legal and essential formalities concluded, the program continued with a number of notable speakers.

"C. H. Purcell, Chief Engineer of the Bay Bridge and its railway facilities, was introduced by Supervisor John Ratto of San Francisco, chairman of the San Francisco citizen committee for the celebration, acting as chairman of the day. Mr. Purcell was described by Mr. Ratto as "a man who has probably accomplished more for the San Francisco Bay Region as a whole in a shorter period of time than any single person" and "a man who has quietly shouldered tremendous responsibilities and who has executed these responsibilities with great skill and amazing success."

Mr. Purcell said, "Into this project have gone the skill and experience of the engineering profession—civil, electrical and mechanical. Great praise is due the staff of engineers employed by the State Department of Public Works on design and in the field. Also to Bridge Engineer Charles E. Andrew and to Engineer of Design Glenn B. Woodruff, who worked faithfully, conscientiously, and ably, special praise is due.

"Appreciation is also due the fine cooperation given by the American workmen employed on the project; by the contractors engaged in the construction of the facilities and by the railroads who will operate the system.

"To the Federal Government, through the Reconstruction Finance Corporation, and to city and county governments thanks are given for the invaluable aid given us."

Mayor Angelo J. Rossi of San Francisco welcomed the visiting Mayors. Among those who spoke briefly were Mayor T. B. Monk of Sacramento; Dr. William McCracken, Mayor of Oakland; Edward N. Ament, Mayor of Berkeley; Henry A. Weichart, Mayor of Alameda; Oliver Ellsworth, Mayor of Piedmont; Earl Derry, Mayor of San Leandro.

Florence M. McAuliffe, special counsel for the California Toll Bridge Authority, read a telegram of regret from Jesse F. Jones, chairman of the Reconstruction Finance Corporation. The telegram, addressed to Charles H. Purcell, said:

FRANK W. CLARK
Director of Public Works

"I very much wish I could be present at the dedicatory ceremonies starting interurban service on the San Francisco-Oakland Bay Bridge. Again I am reminded that the design and construction of this bridge is one of the outstanding engineering feats of our generation. It is beautiful as well as being of great service and will stand a credit to all who had part in the great achievement. I extend hearty congratulations to San Francisco, Oakland and California."

Howard J. Klossner, a director of the Reconstruction Finance Corporation, spoke for the Corporation; and H. R. Judah, chairman of the State Highway Commission and member of the California Toll Bridge Authority, gave a brief but impressive talk.

Frank C. MacDonald, general president of the State Building and Construction Trades Council of California, who was introduced by Director Clark, spoke on behalf of labor.

The 1500 guests had been brought to the ceremonies by Key System and Sacramento-Northern trains. Two six unit Key System trains left 22d and Broadway in Oakland at 10:30 a.m., traveling smoothly over the bridge and arriving at the San Francisco Terminal for the ceremonies at 11:15 o'clock. Labor representatives, contractors' representatives, and civic officials of Alameda and San Francisco counties were present.

A Sacramento-Northern train, originating at Chico, carried mayors and distinguished guests of the Northern California towns along the route. Members of the State Legislature, who had been invited by Governor Olson to attend, were among the guests.

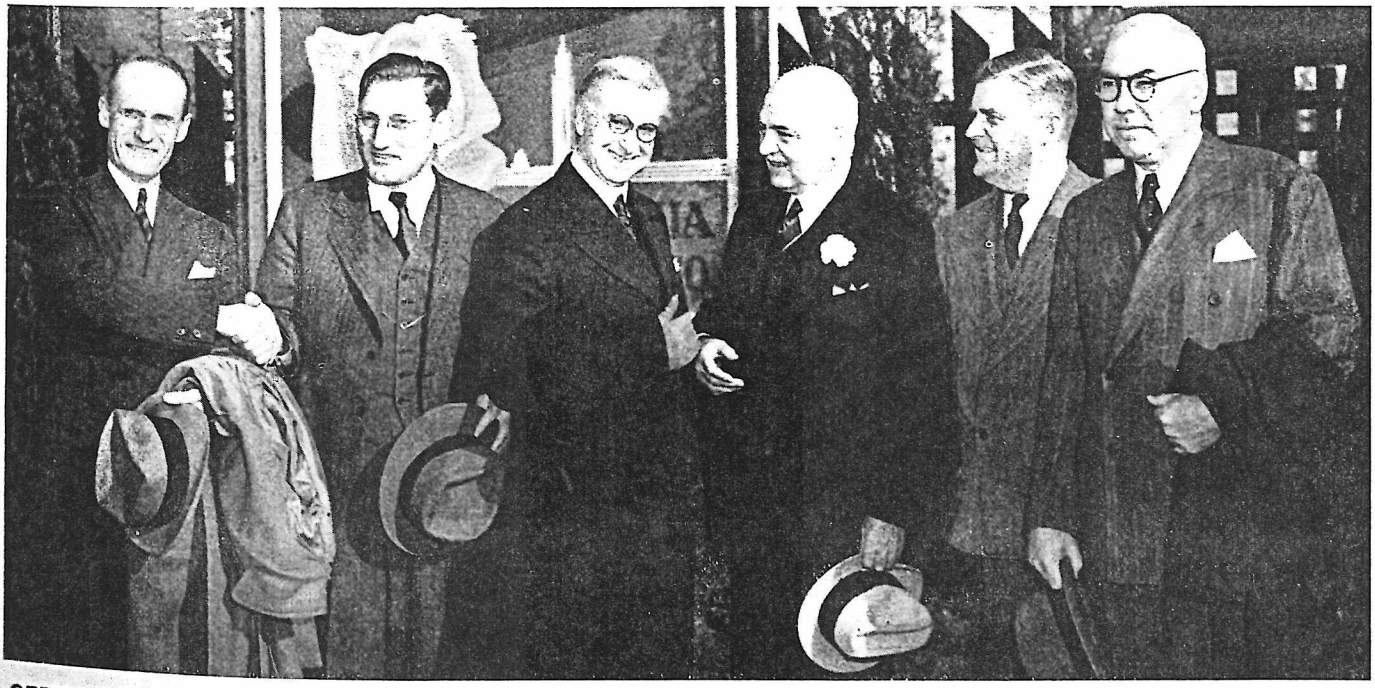
More than 5,000 persons gathered in the plaza before the handsome new Terminal to listen to the ceremonies. After completion of the dedication program the building was opened to the public for inspection. Thousands wandered through the modern structure during the day and evening.

Operation and maintenance of the Bridge Railway is now in the hands of the railways, a board of governors having been named by the railroads for management of the facilities. Named were R. E. Hallawell, General Manager of Interurban Electric; and William P. St. Sure, Vice President of the Key System. F. E. Sullivan was appointed Superintendent of the Bridge Railway and Orman Lutz was named Business Manager by the Board.

The construction chronology of the Bay Bridge Electric Railway facilities is as follows:

(Continued on page 28)

Terminal Plaza showing trolley car loop ramp to mezzanine level and street entrances for pedestrians and automobile passengers.



OFFICIAL GROUP—Left to right—Frank W. Clark, State Director of Public Works; Lieutenant Governor Ellis E. Patterson; Mayor William McCracken of Oakland; Mayor Angelo J. Rossi of San Francisco; John F. Hassler, City Manager of Oakland, and C. H. Purcell, Chief Engineer of Bay Bridge and its railway facilities.

Pinole Grade Crossing Project Presents Many Difficultie

(Continued from page 20)

Santa Fe tracks with a very narrow intersecting road at the westerly end.

This section of highway is in the direct line of heavy auto and freight traffic between the East Bay cities and the Sacramento Valley. Its improvement will correct the substandard condition now existing. An average daily traffic of over 8000 vehicles passes this point. The Sunday traffic amounts to more than 12,000 vehicles.

DETOUR CONSTRUCTED

It has been necessary to maintain close cooperation between the railroad and highway construction operations in order to facilitate an early completion of the project. The maintenance of uninterrupted service on both the railroad and highway demanded close coordination in executing the various phases of the work in the proper sequence. Inasmuch as the railroad cut completely blocked and destroyed the old highway, and since there were no available roads over which highway traffic could by-pass the project, it was necessary to construct a highway detour around the work.

The construction and maintenance of such a detour involved the expenditure of approximately $14,000. This amount was exclusive of the cost of the detour bridge which is to remain in place to serve as a permanent connection to the town of Hercules. Of this amount, approximately $2,000 was required for the installation of warning signs, lights, traffic stripe and guard rail to warn and protect the traveling public.

HIGHWAY BRIDGE BUILT

The realignment of the railroad track, substituting an open cut for the existing railroad tunnel, makes necessary the construction of a highway bridge to span the track. This structure requires new alignment for the highway approaches which are being constructed to a standard divided highway with a 4-foot dividing strip.

The dividing strip separates two 23-foot highway lanes, each of which has a 7-foot shoulder. The 23-foot pavement lanes will be surfaced with six inches of crusher run base topped with three inches of plant mixed surfacing. The shoulders will be given a penetration oil treatment. The dividing strip will be inclosed between concrete curbs. At each end of this section the dividing strip will be carried to the end of the vertical curves, and there will be a 400-foot transition in pavement width, narrowing down to bring the 4-lane pavement to the existing 3-lane pavement width.

At the west end the dividing strip will terminate in the restricted speed zone area within the city limits of Pinole, and the nose of the dividing strip will be provided with 3-inch ruby reflectors. At the east end, due to the faster speed of traffic approaching the divided roadway and the possibility of confusion during night driving and probable fog condition, an automatic amber flasher traffic signal will be installed in the nose of the dividing strip.

GRADE SEPARATION

The grade separation structure spanning the railroad track is of continuous flat slab construction resting on concrete bents with two expansion joints in the deck at the quarter points. The bridge is 425 feet in length, consisting of eleven 34-foot spans and two end spans each 25 feet 6 inches in length. The roadway width between curbs is 54 feet consisting of two 25-foot traffic lanes separated by a 4-foot dividing curb. A 2-foot 6-inch sidewalk is provided on each side of the bridge for pedestrian traffic.

After relocating the various public utilities which interfered with construction, constructing the detour and routing highway traffic over it, the next step was to start the excavation for the new railroad roadbed. This operation was so planned that work on the grade separation structure could be started immediately. The next order of work was to construct the southerly one-half of the structure, which portion spans the railroad track at its new location. When the southerly one-half was complete, the railroad realigned, and the new track placed in operation, it was then possible to construct the northerly one-half of the structure without interference from train traffic.

The work is being done in cooperation with the A. T. & S. F. Railroad. The railroad company is performing the work of relocating its track and assuming the cost thereof. The r road portion amounts to approxim ly $125,000, and the State's port consisting of the construction of overhead structure together with cost of highway approaches, will approximately $110,000. The Sta portion is included in the Fed Aid Grade Separation Program is being financed from Federal fu

The excavation for the railroad cation is being performed under tract by Sharp and Fellows of Angeles, and the construction of grade separation and highway proaches is being performed u contract by the Union Paving C pany of San Francisco. The cont date for completion is June 16, 1

Bay Bridge Terminal Dedicated Jan. 14, 193

(Continued from page 8)

Dec. 21, 1936—First demolition of build ings for terminal site.

July 29, 1937—First shovelful of ear excavated for terminal site, southea corner of Natoma and Fremont.

Nov. 29, 1937—First tie on bridge prop laid at Span E-22.

Jan. 12, 1938—First structural steel fo terminal unit erected at First Street be tween Natoma and Minna Streets (12 foot steel columns).

Jan. 14, 1938—First major steel erecte at Natoma and First Streets (43-fo steel girder).

Feb. 1, 1938—First spike for bridge rai way placed at Span E-22.

Mar. 8, 1938—First steel for track lev (third story) of Terminal Buildi erected at Fremont Street.

Sept. 23, 1938—First test train (Ke System) ran from East Bridge head t Pier W-1.

Oct. 13, 1938—First test train of Inte urban Electric (S. P.) on bridge.

Dec. 14, 1938—First train enters S. F Terminal (Key System train) for signa tests.

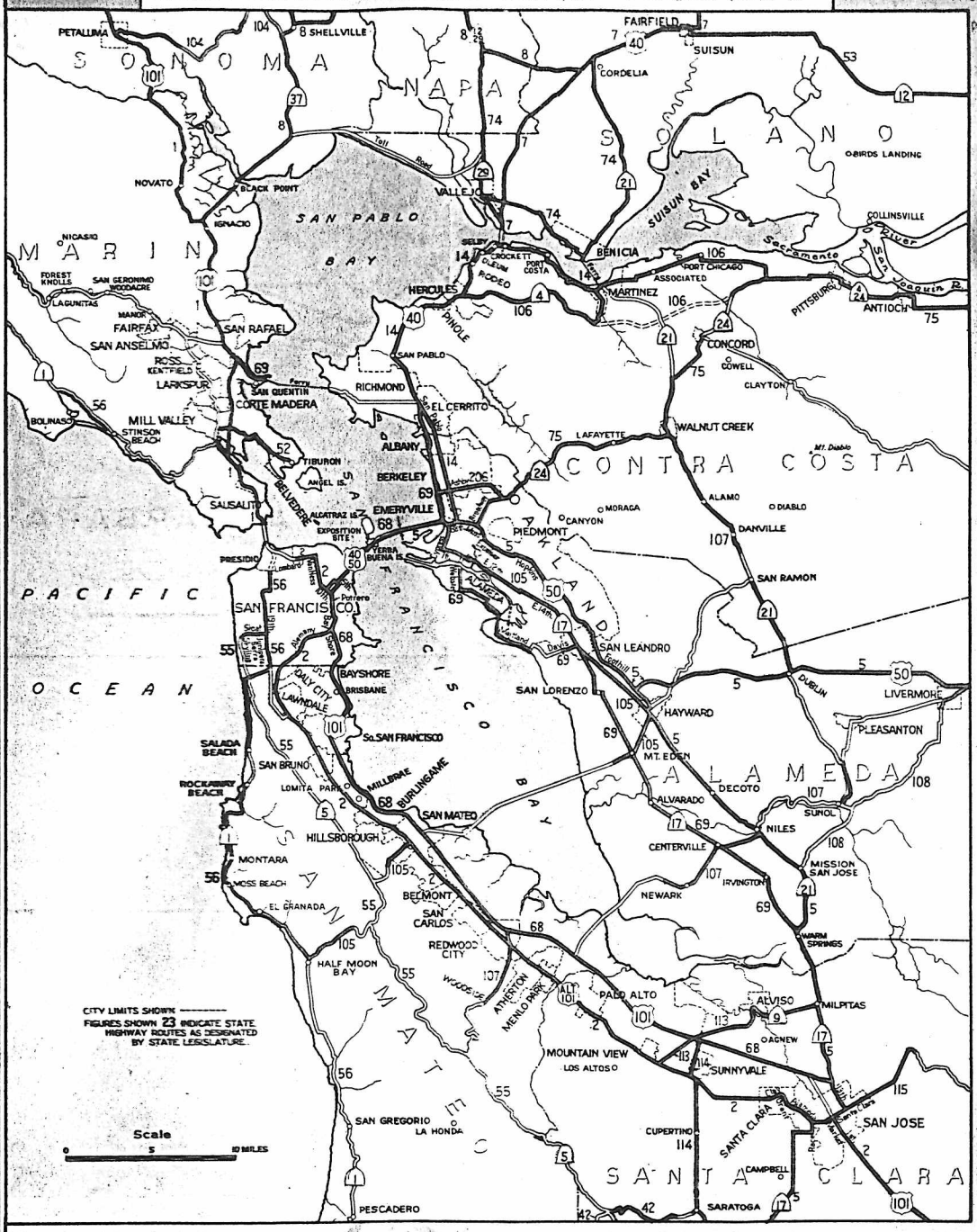
Dec. 17, 1938—First Interurban Electr train enters S. F. Terminal from Oakla

Dec. 20, 1938—Sacramento-Northe makes first test trip into San Francis Terminal.

Jan. 5, 1939—Power turned on third r

Tests continue nightly until start operation, January 15.

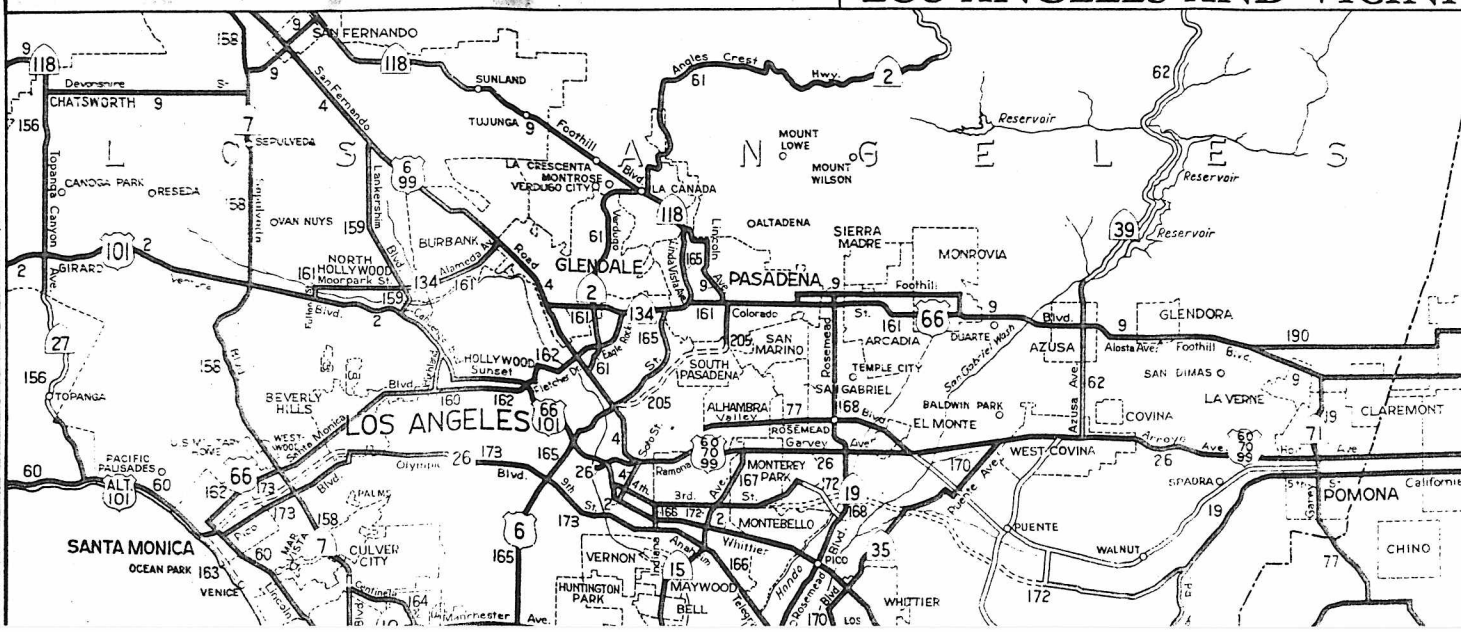
SAN FRANCISCO AND VICINITY

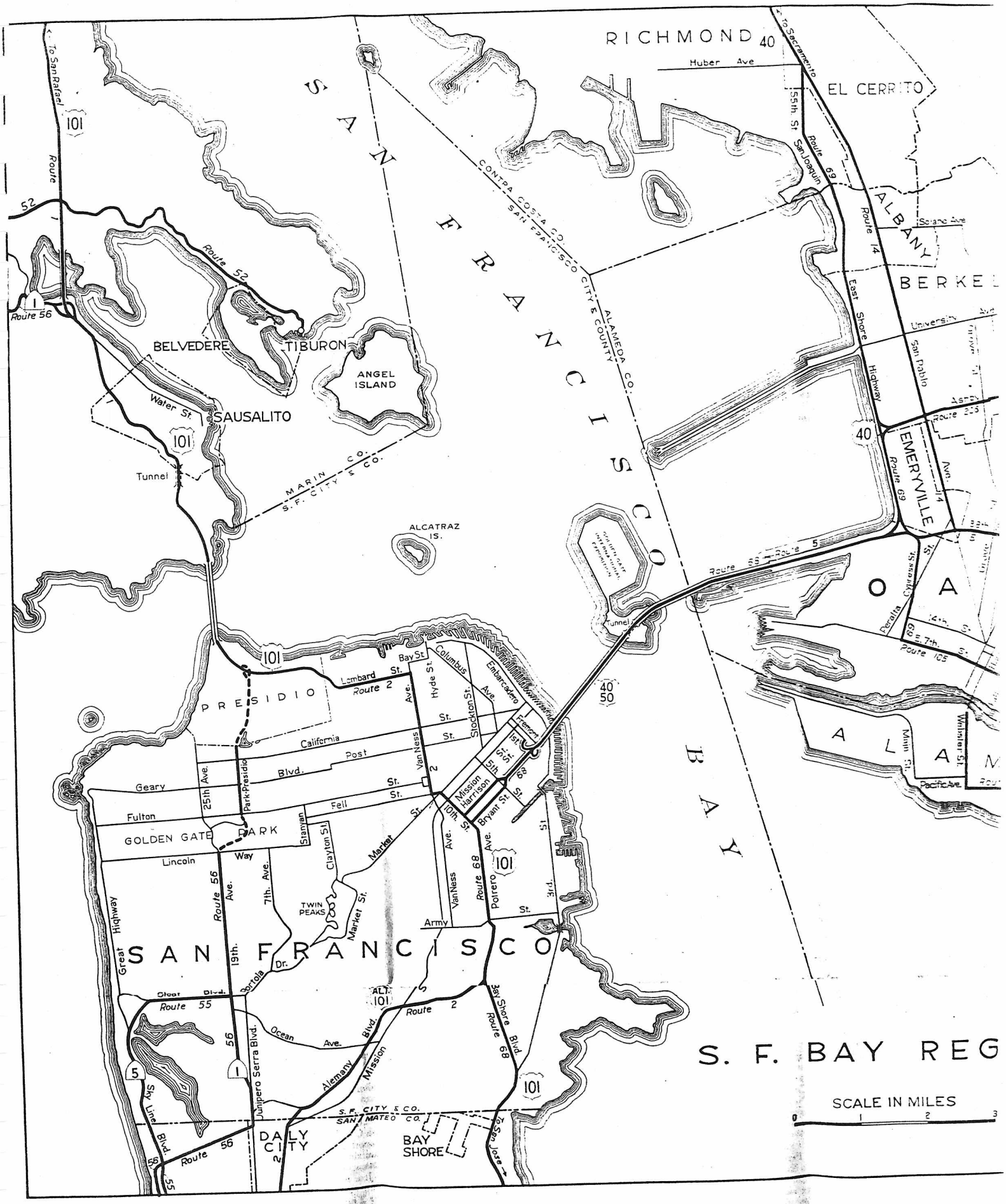


PACIFIC GROVE
MONTEREY
CARMEL
Seaside
Chualar
Gonzales
SOLEDAD
Carmel River
Salinas
Pt. Sur
Big Sur
Tassajara Hot Sprs.
Lopez Pt.
Lucia
Piedras Blancas Pt.
PACIFIC OCEAN

1938

LOS ANGELES AND VICINITY

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ALBANY
Solano Ave
BERKE
East Shore
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University Ave
San Pablo
Ashby
Route 123
EMERYVILLE
Route 69
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40
Route 5
Peralta
Cypress St.
7th St.
Route 105
Webster St.
Pacific Ave.
Route 2
Bay St.
Columbus
Embarcadero
Hyde St.
Lombard St.
Stockton St.
Van Ness Ave.
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California St.
Post St.
Geary St.
Fulton St.
Park-Presidio Blvd.
25th Ave.
Fell St.
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GOLDEN GATE PARK
Lincoln Way
Route 56
7th Ave.
19th Ave.
Great Highway
TWIN PEAKS
Market St.
Army St.
Potrero Ave.
Route 68
3rd St.
SAN FRANCISCO
Portola Dr.
Clear Blvd.
Route 55
Ocean Ave.
Junipero Serra Blvd.
Sky Line Blvd.
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S. F. CITY & CO.
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To San Jose
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ANGEL ISLAND
Water St.
SAUSALITO
Tunnel
MARIN CO.
S. F. CITY & CO.
ALCATRAZ IS.
CONTRA COSTA CO.
SAN FRANCISCO CITY & COUNTY
ALAMEDA CO.
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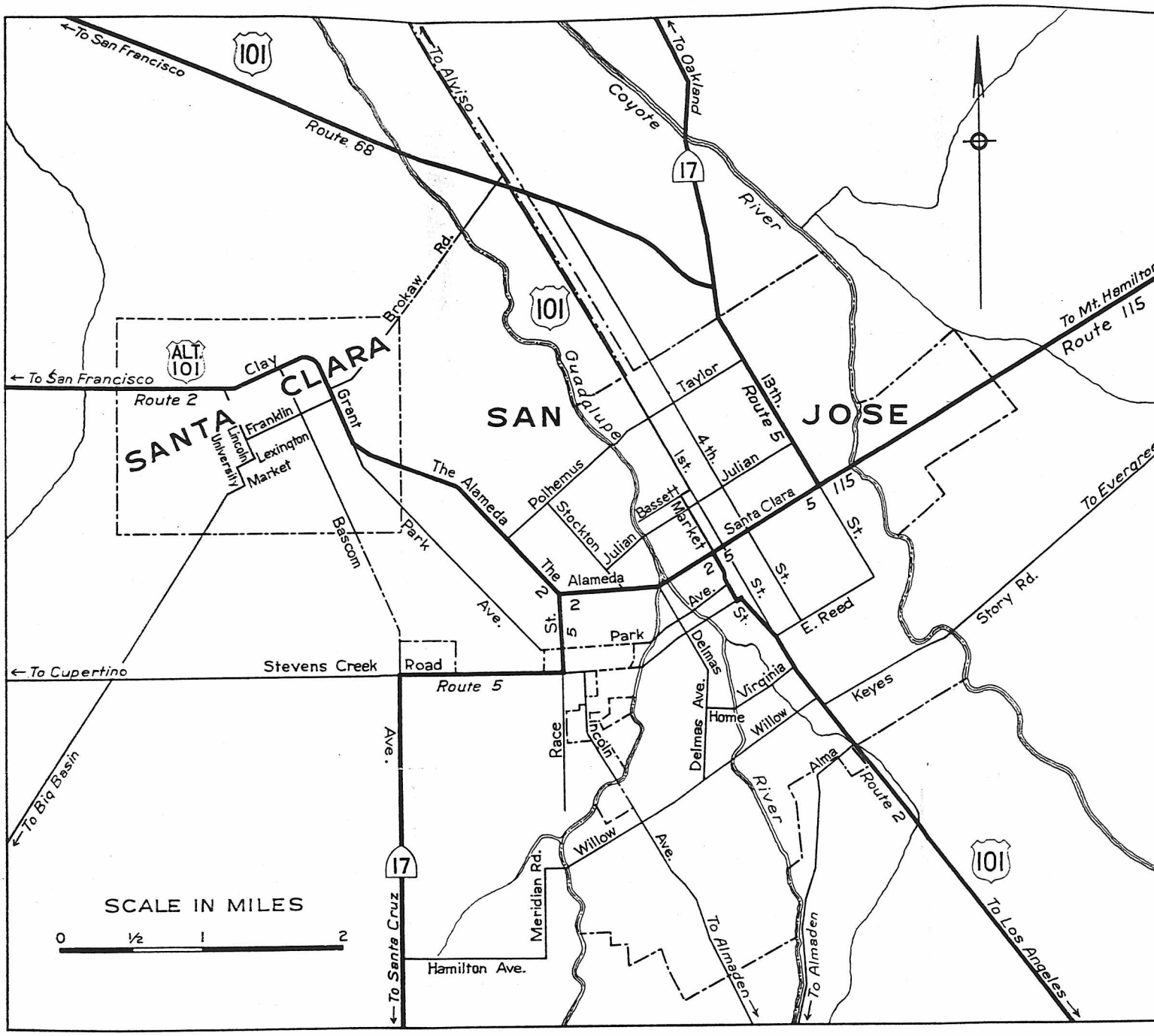
1938


To San Francisco
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River
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To Mt. Hamilton
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Clay
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Grant
Franklin
Lincoln
University
Lexington
Market
SAN JOSE
Guadalupe
Taylor
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The Alameda
Polhemus
Stockton
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Bassett
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To Cupertino
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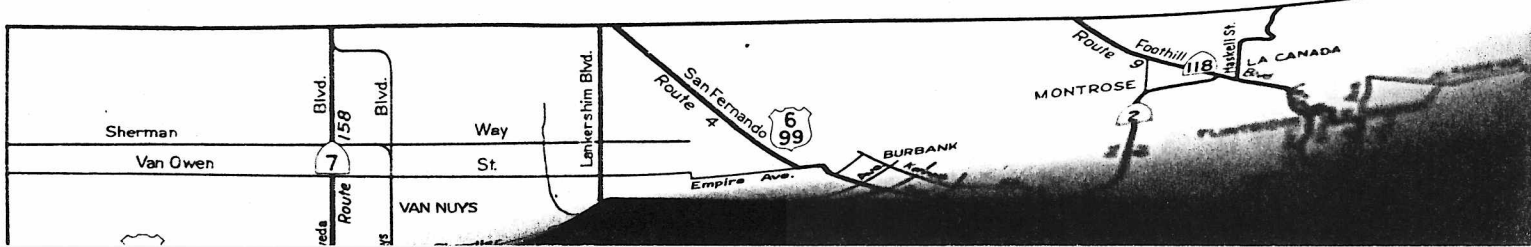
Sherman
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San Fernando
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BURBANK
Empire Ave.
Route
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Foothill
118
Hasbell St.
LA CANADA
MONTROSE
2

Eleventh Biennial Report

of the

Division of Highways

of the

Department of Public Works

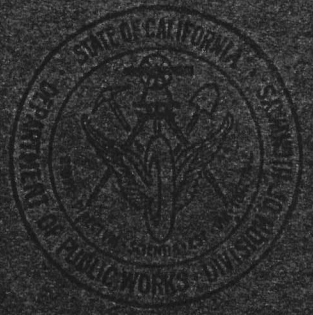
State of California

to the

Director of Public Works

November 1, 1938

BARL LEE KELLY, Director of Public Works
C. H. PURCELL, State Highway Engineer
and Chief of Division of Highways



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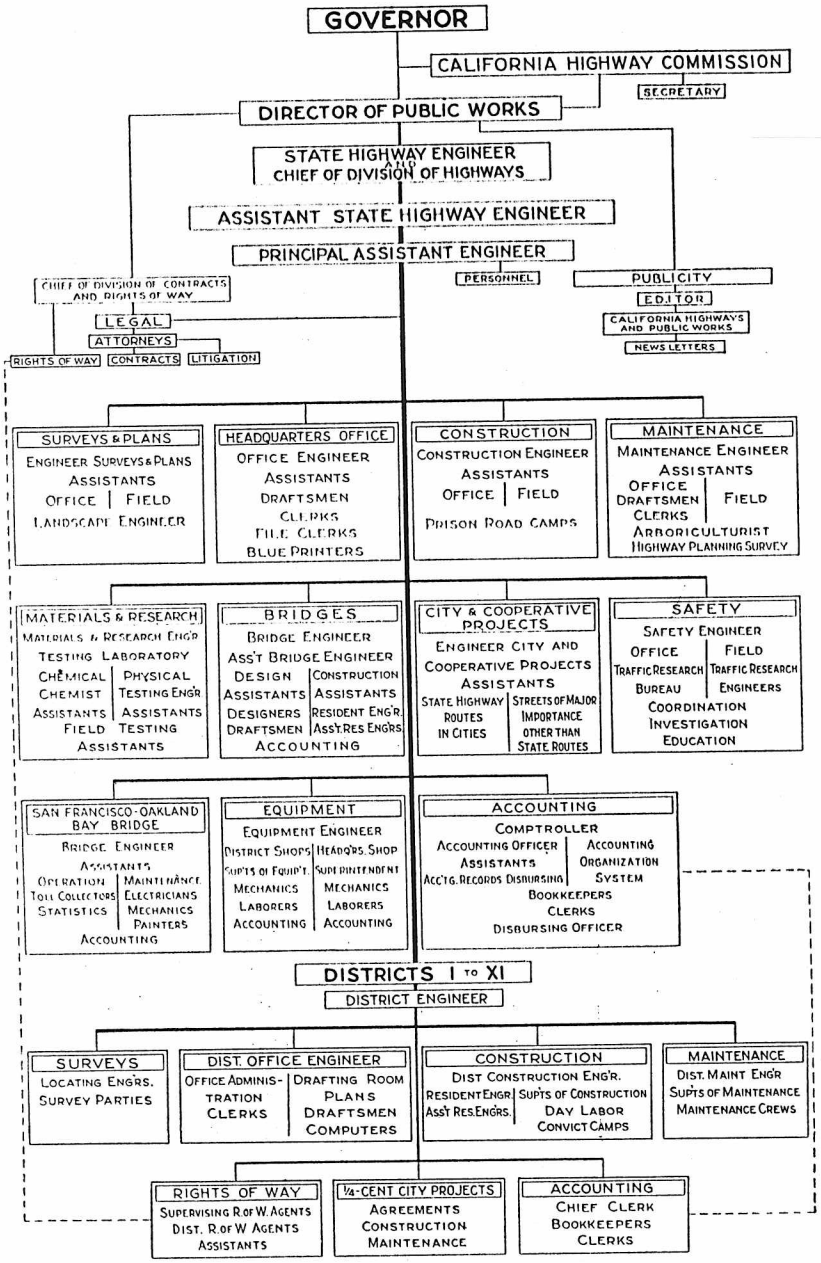


ORGANIZATION CHART OF THE DIVISION OF HIGHWAYS
DEPARTMENT OF PUBLIC WORKS
1938

REPORT OF THE STATE HIGHWAY ENGINEER

HONORABLE EARL LEE KELLY,
Director of Public Works,
State of California.

SIR: For the California Division of Highways the two years from July 1, 1936, to June 30, 1938, marked a period of progress in highway design and construction practice and of great activity in a program of widespread improvement to the State highway system. Adoption of new standards for pavement and roadway widths and commitment to a definite policy of multiple lane construction on main arterials, together with the establishment of a new department under the direction of a Safety Engineer, are important factors with which the Division of Highways is working towards the solution of California's traffic problem.

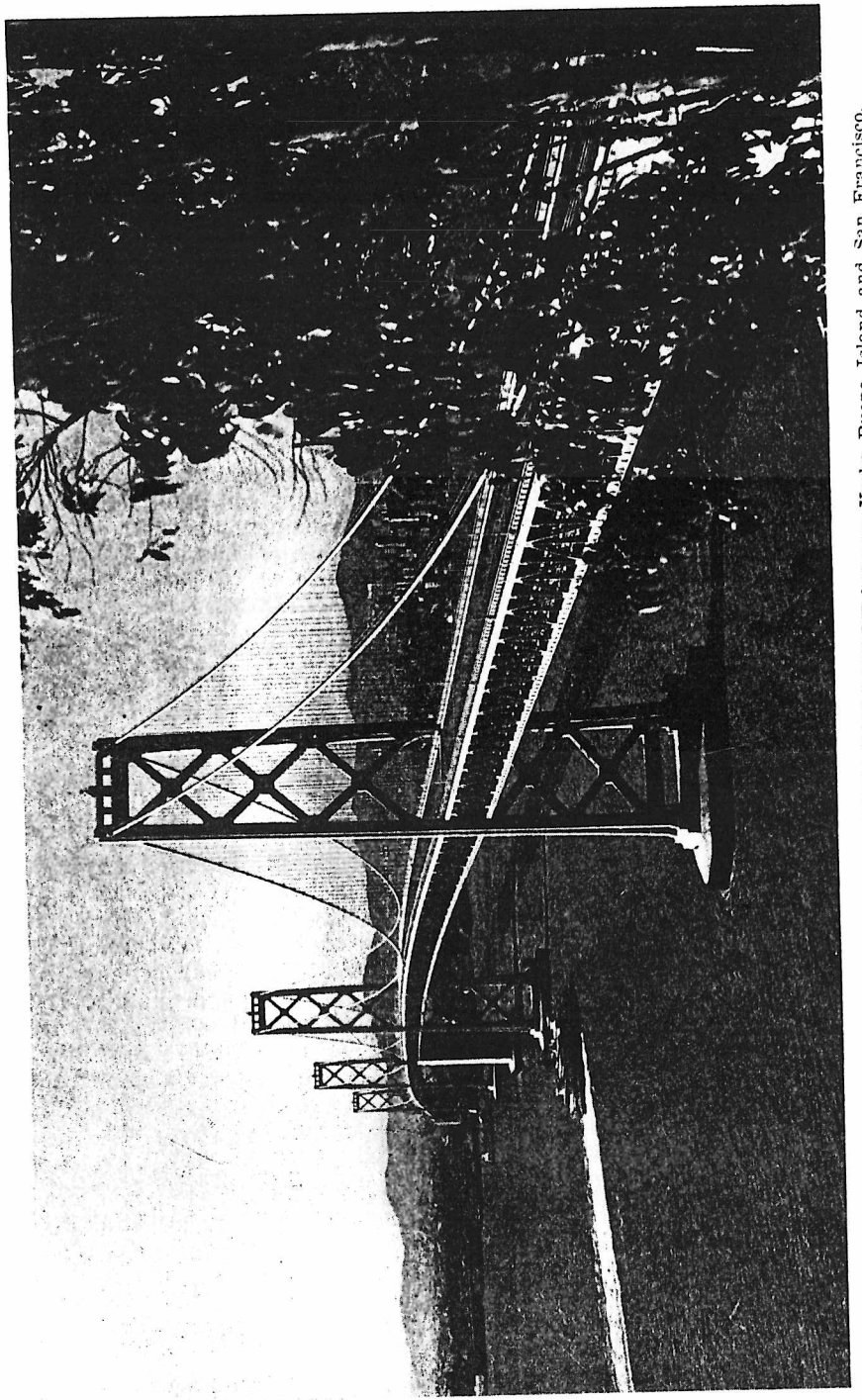
Continued Federal apportionments for both feeder road development and grade crossing elimination have provided the means for further improvement of the farm-to-market type of secondary road and construction of major railroad grade crossing structures.

LEGISLATION

Legislation passed by both the regular session of the State Legislature in 1937 and the special session in 1938 provided for a use tax of three cents per gallon on fuel used by trucks and busses powered by the diesel type of motor. The act providing for revenue derived from this taxation specifies that the funds are to be used for reconstruction of bridges on the State highway system which are posted for less than legal loads or less than legal speeds. This additional revenue has made possible a program for systematic reconstruction of many inadequate structures and, while the funds derived from the diesel oil tax will not be sufficient for replacement or rebuilding of all such bridges, there will be released for much needed new bridge construction equal amounts of funds from the other revenues.

SAN FRANCISCO-OAKLAND BAY BRIDGE

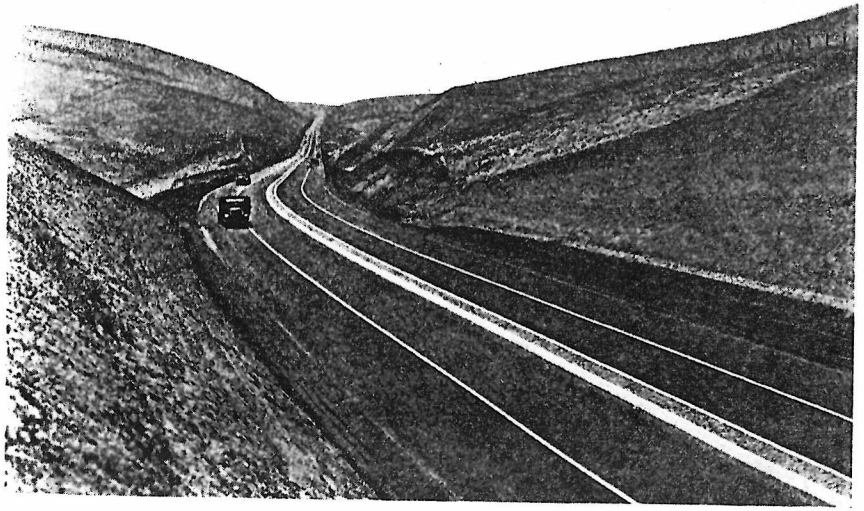
On November 12, 1936, the San Francisco-Oakland Bay Bridge was opened to vehicular traffic and its operation and maintenance assumed by the Division of Highways. The first contracts for construction of this longest bridge in the world were awarded on April 28, 1933, and the work under the direction of the San Francisco-Oakland Bay Bridge construction organization has progressed rapidly during the past five years. While the bridge has been in operation for motor vehicles and trucks for nearly two years, construction of the railway facilities on



WEST CROSSING OF SAN FRANCISCO-OAKLAND BAY BRIDGE between Yerba Buena Island and San Francisco.

the bridge to carry electric trains across the bay has been under way. It is anticipated that this work will be complete early in 1939.

During the eighteen months since the opening of the bridge a permanent maintenance and operation organization has been formed providing for painters, electricians, mechanics, and necessary crew of toll collectors and accounting forces required to carry on the work of operating the structure for the average of 24,000 vehicles which daily cross the bridge.



FOUR-LANE HIGHWAY with Curbed Dividing Strip on New Altamont Pass Highway in Alameda County.

DESIGN AND CONSTRUCTION PROGRESS

An important change in highway design was made in the fall of 1937 when the standard pavement lane width for two lane highways was increased from ten feet to eleven feet. The present day trend in automotive construction for higher speed and wider trucks and busses has made impractical the ten-foot lane and has necessitated more room for freedom of movement in passing. Standards of traffic lane widths for multiple lane pavements were increased at the same time.

While construction of divided four and six lane pavements for arterial routes are not new in California, this design has received most intensive study during the past two years. Results from these investigations have led to the determination of standards of practice governing this type of construction. The safety features of divided roadway construction on heavily traveled routes are such that the Division of Highways has adopted as a definite policy this type of design for highways requiring four or more lanes. A minimum width of four feet has been established for a median strip between traffic ways and, with the exception of locations where only a rolled or roughened strip is used, all dividing strips of twenty feet or less are constructed with curbs.

Much study also has been given to the design and construction of highway intersections where traffic is such that separation of grades is not economically justified. The proper channelizing of traffic at such intersections by means of islands or pavement markings and with simple, intelligible signing, which requires no hesitation by the driver, is a vital safety factor. Definite patterns for various types of intersections have been formulated to carry traffic through and across them with maximum safety and minimum delay. The provision of accelerating and decelerating lanes for the use of vehicles entering or leaving such intersections is a most important phase of the design.

Investigation and study of foundation stabilization continues as one of the most important functions of the engineering staff. Modern alignment requiring heavy excavation and high embankments has necessitated the determination of means and methods for preventing slides and slip-outs of the undisturbed materials. While various treatments of these conditions have met with a degree of success, investigation and study must continue toward complete solution of this most fundamental of highway construction problems.

STORM DAMAGE

The unusually severe storms of December, 1937, and March, 1938, caused damage to roads and bridges on the California State highway system which was estimated to be approximately $9,000,000. Restoration of roadways and bridges damaged by the floods resulting from the storms has necessitated material curtailment of both construction and maintenance programs.

The first devastating effect of the unusual winter was felt in December, 1937, when floods resulting from a three day storm in northern California damaged roads and bridges on the State highway system to an extent of more than $2,000,000. During the months of January, February and a portion of March, unusually heavy rainfall was experienced throughout the greater part of the northern coastal counties. Weather Bureau records in Eureka, California, indicate that the rainfall for the winter exceeded that of any year since 1903-1904. This same condition prevailed at most locations in the counties of Del Norte, Humboldt, Mendocino and Lake. As a result, the ground throughout this area became supersaturated, and attendant slipouts and slides of unusual magnitude produced deformation of highway alignment and grades and serious damage to bridges.

As a climax to this period of intense rainfall in the northwestern portion of the State, southern California experienced a storm of unusual severity from February 27 to March 3, 1938, which had not been duplicated for a great number of years. Records of the United States Weather Bureau at Los Angeles showed a total precipitation of 11.06 inches in 96 hours, breaking all local records for rainfall in a four-day storm. This extraordinary precipitation created flood heights in the major streams in the Los Angeles and San Bernardino area, which were higher than any previous floods for which observations had been taken, covering in one instance a period of forty-four years.

As previously stated the damaging effects of these combined storms and long periods of intense rainfall will require an estimated expenditure of $9,000,000 for restoration and protection to the California State highway system.

These storms presented an unusual opportunity for study of erosion and the effectiveness of various types of bank protection. Engineers from the Division of Highways conducted an exhaustive study in the field of the many types of slope and bank protection work and prepared a comprehensive report of their findings with recommendations based upon the most effectual performances during the storms.

SAFETY

For many years the Division of Highways has been most interested in the building of safer highways and in providing features of construction and maintenance for safer travel. The several departments of the Division having to do with design, construction, and maintenance have made constant studies of this phase of highway work and have accumulated statistics and findings on safety matters.

In March, 1938, a Safety Engineer was appointed to collect and correlate material relative to accidents on the State highway system and to make studies of safety features leading toward the provision of highway facilities which will give motorists the maximum in protection.

The Safety Engineer's organization is now functioning as an important unit in the Division of Highways.

FEDERAL FUNDS

Appropriations by Congress of Federal funds for apportionment to the several States for highway construction purposes have been of great assistance in the development of highway systems. California has benefited greatly from this source of additional revenue. Federal regulations, however, provide that such apportionments be paid as reimbursements by the Federal government after the work has been performed. This requirement necessitates the financing of all construction projects by the State prior to reimbursement, a condition which must be borne in mind in discussions relative to Federal apportionments for highway improvement.

As stated in the Tenth Biennial Report, an act was approved on June 16, 1936, amending the Federal Aid Highway Act and providing Federal funds for the construction of highways and the elimination of hazards at railroad grade crossings for the fiscal years ending June 30, 1938 and 1939. Under this act, known as the Authorization and Amendment of June 16, 1936, California was apportioned for the two year period ending June 30, 1939, the sums of $9,593,488 for regular Federal Aid projects; $1,918,698 for secondary or feeder road projects; $3,700,209 for the elimination of hazards at railroad grade crossings; and $474,839 for Federal Land Highway projects.

Provisions of the act stipulated that no part of the appropriations thereafter made would be approved for expenditure on any highway unless proper safety protective devices complying with Bureau of Public Roads standards be installed or be in operation at highway and railroad grade crossings or draw bridges on that portion of the highway where such expenditures are to be made.

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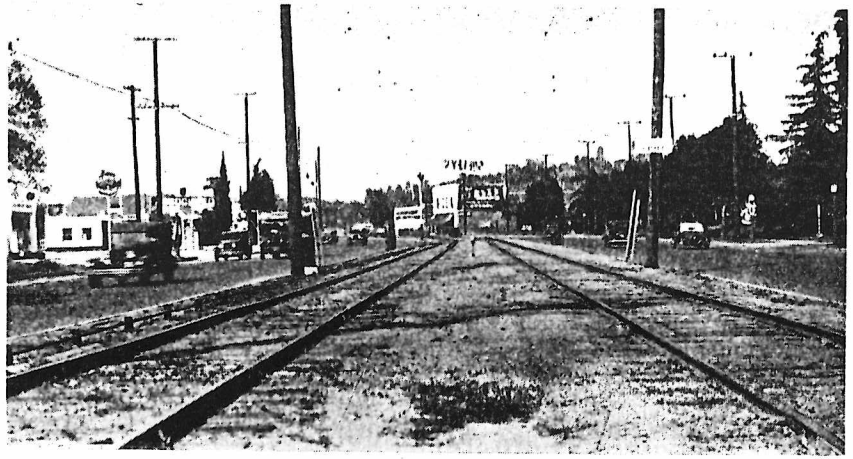
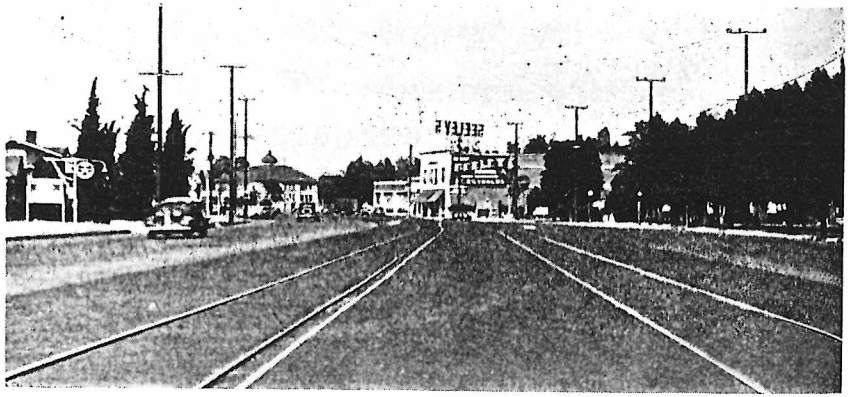




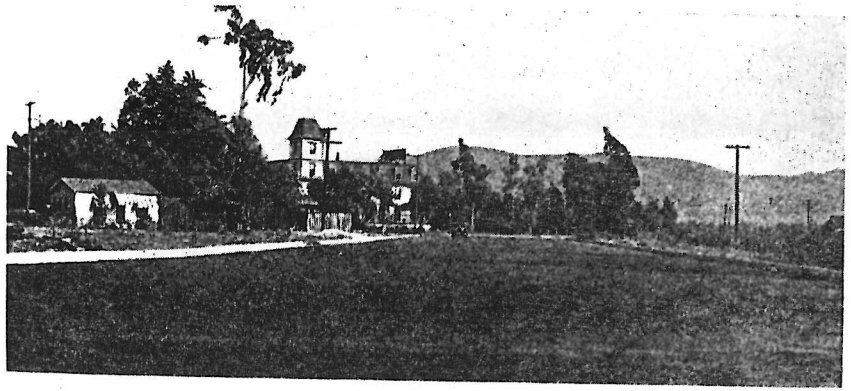
BRAND BOULEVARD, a street of major importance in Glendale. Before and after construction.

extended in a northeasterly direction via Browns Valley, Challenge, and Strawberry Valley, to points in northern Sierra and southern Plumas Counties. The other branch extended in an easterly direction via Dobbins, Summit House, Foster's Bar, and Camptonville into the Downieville area.

Supplies were hauled in large wagons, holding about ten tons of freight, drawn by 12 to 14 head of stock. The round trip took from seven to ten days.

The Downieville lateral was subsequently constructed by the State as a State highway extending from Nevada City north via North San Juan and Camptonville to Downieville. When the Bullard's Bar Dam was constructed across the North Fork of the Yuba River and the lake created caused the abandonment of the old original road, a new road was constructed crossing over the top of the dam and connected with the new State highway at the "Log Cabin" station.

Joint Highway District No. 25. Organized June 30, 1937, by the counties of Marin, Sonoma, and Napa for the purpose of constructing a highway from the Golden Gate Bridge Approach near the Fort Baker Gate through the city of Sausalito to connect with the present existing United States Highway No. 101.



MICHIGAN AVENUE EXTENSION IN GLENDORA built with ¼-cent funds for streets of major importance.